TWENTY-FIFTH ANNIVERSARY—OCTOBER, 1922

THE MINING CONGRESS JOURNAL

VOLUME 8 NUMBER 10

TN
I
M6
v. P
no. 10

Physical & Applied Sci. Serials

Engineering

LIBRARY OCT 9 UNIVERSITY OF TORONTO

Industrial Cooperation

THE prosperity of an industry and its place in public estimation largely are based upon the degree of harmony with which its affairs are conducted.

In its twenty-five years of service, The American Mining Congress probably never has undertaken a greater work than that contemplated through its newly created Division of Industrial Cooperation.

It firmly believes that industrial peace in the mining industry may be obtained upon a common ground where employer and employe can meet and that this common ground is born of confidence and is sustained through recognition of interdependence.

It seeks the cooperation of its membership in the working out of this great problem, and pledges its earnest effort in securing an understanding of the basic needs of both capital and labor.

President

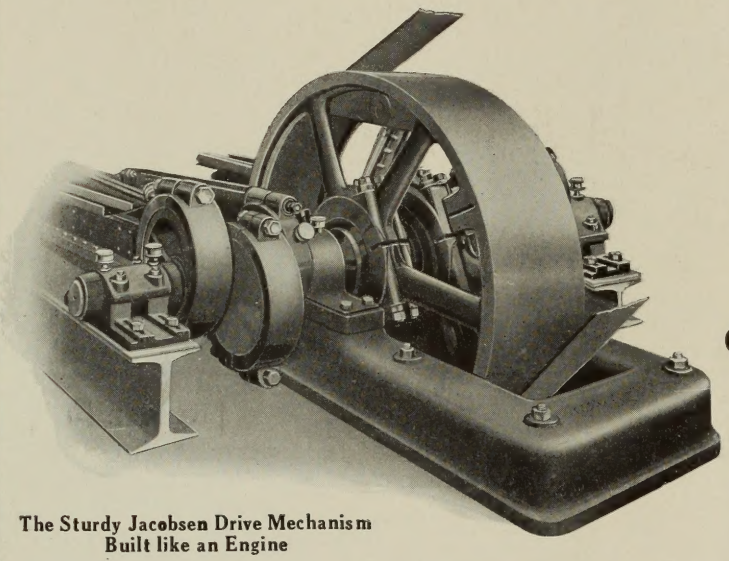
ENGIN STORAGE

Résumé of Twenty-five Years in Mining—Page 933

JACOBSEN & SCHRAEDER, Inc.

Engineers and Constructors

Chicago **Pittsburgh**



The Sturdy Jacobsen Drive Mechanism
Built like an Engine

DESIGN AND CONSTRUCTION

OF

Complete Modern Coal Mining Plants

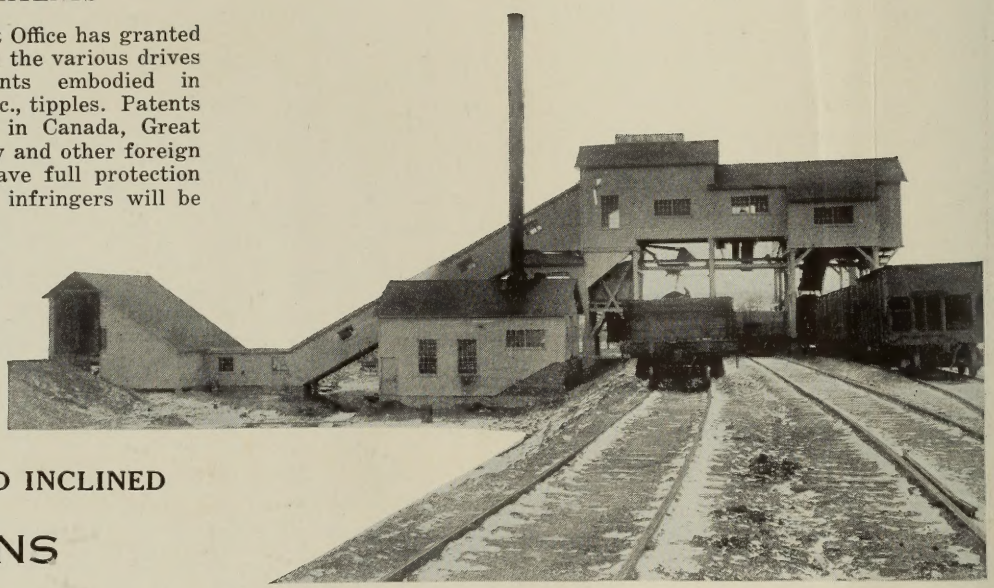
Coal Tipples and Storage Plants

Coal Docks

Material Elevating and Conveying Plants

NOTICE OF PATENTS

The United States Patent Office has granted several Letters Patent on the various drives and screen arrangements embodied in Jacobsen & Schraeder, Inc., tipples. Patents have also been granted in Canada, Great Britain, France, Germany and other foreign countries. All clients have full protection under these patents and infringers will be prosecuted.



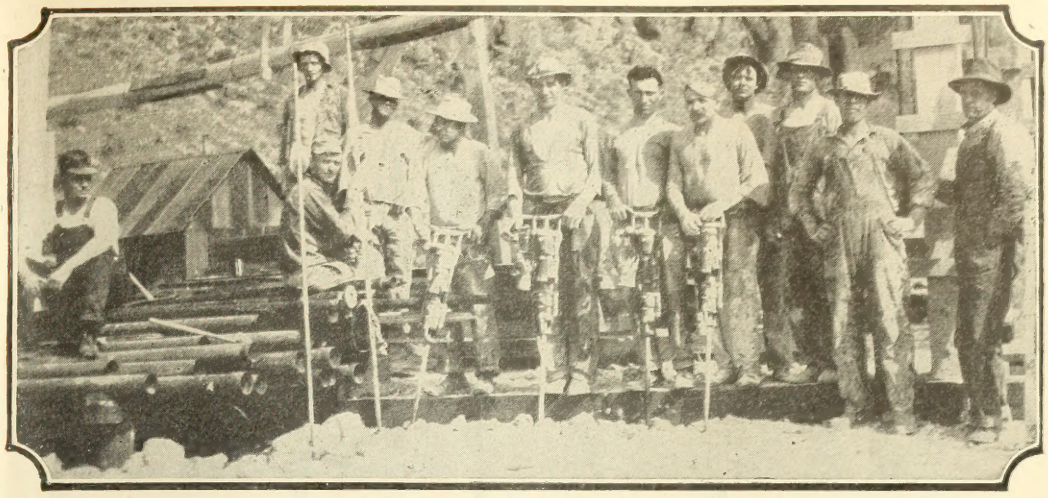
Complete Tipple and Power Plant using Jacobsen Balanced Horizontal Picking Table Screen—Typical Installation for a Stripping Operation

HORIZONTAL AND INCLINED

SCREENS
FEEDERS
CONVEYORS
DRYERS

Investigate our Equipment **Write today for Details**

"The Waugh Way Wins"



Arizona's Champion Eleven

254 FEET---31 DAYS---NO REPAIRS

HERES' a record worth recording. Under the direction of Superintendent Charles F. Pugh, Johnson and Burris, contractors for the Oatman Gold Mining and Milling Company, recently completed 500 feet of 3-compartment shaft at Oatman, Arizona, averaging, for 254 feet, 8 feet 3 inches per day in hard andesite, which is said to be the fastest time ever made on such a job in the state of Arizona. A completely timbered shaft, 17x7 feet over-all and 254 feet in depth, was finished in 31 days. The drilling was done by 3 Waugh Clipper drills in the hands of a splendid crew and not one penny of expense was incurred for drill upkeep.

GOOD work like this can only be done with good drills and because it is done so often with Waugh's miners now generally admit that "The Waugh Way Wins." May we send you our Waugh shaft sinker booklets? Just write the nearest Waugh branch office today and ask for bulletins M-C55, M-C60 and M-C95.

THE Denver Rock Drill Manufacturing Co.

Denver, Colorado

San Francisco, Scranton, El Paso, Los Angeles, Seattle, Salt Lake City, Joplin, Wallace, Birmingham, Lima, Santiago, Duluth, New York City, Houghton, Butte, Melbourne, Mexico City

Canadian Rock Drill Company, Limited

Sole Agents in Canada

Toronto, Cobalt, Nelson, Vancouver

The Denver Rock Drill & Machinery Company, Ltd.

Sole Agents in South Africa

Southern Life Building

Johannesburg, Transvaal, South Africa

K-36

Aero Brand Cyanide

Efficiency must, of course, be considered in all comparisons of real costs.

The economy of Aero Brand Cyanide rests not only upon low costs but also upon efficiency of performance in the mill.

Aero Brand Cyanide is being used at normal or superior efficiency under practically every variety of conditions found in the extraction of the precious metals from their ores.

AMERICAN CYANAMID COMPANY

511 FIFTH AVENUE NEW YORK CITY

THE MINING CONGRESS JOURNAL

OCTOBER, 1922

CONTENTS

$3.00 Per Year
30c Per Copy

Page

EDITORIALS

Organized Labor 897
A Challenge to Government 897
Trifling within Inexorable Laws 898
Coal's Self-government 898
The Surrender of Gary 899
The Mistakes of Moses 899
The Future of the Bituminous Industry 900
Trading Wrecks 900

ILLUSTRATIONS

W. J. Loring 901
Thomas T. Brewster, Carl Scholz 902
Sidney J. Jennings, Bulkeley Wells 903
Daniel B. Wentz, Hugh Shirkie 904
H. W. Seaman, Robert Linton 905
E. L. Doheny, John C. Howard 906
James F. Callbreath 908
E. C. Porter 909
Burton Bunch 910
Herbert C. Hoover, Richard F. Grant, John A. Penton, Michael Gallagher, Charles E. Adams, W. R. Woodford 911
Newton D. Baker, J. J. Bernett, T. K. Maher, C. E. Maurer, Charles Briggs, S. H. Robbins 912
Carmi A. Thompson, Benedict Crowell, Claude J. Peck, Crispin Ogleby, Frank D. Fretter, John A. Kling 913
James R. Mills, A. S. Gould, George H. Hall, M. P. Reynolds, Frank A. Scott, Edwin S. Church 914
W. C. Hanley, S. D. Wright, A. E. Reed, W. E. Huber, John Andrews, Jr., H. L. McKinnon 915
F. B. Richards, A. A. Augustus, Henry A. Raymond, Elton Hoyt, 2d 916
John E. Miller 917
Board of Governors, Western Division, Members of; D. D. Muir, Jr., John M. Sully, William F. Word, Robert E. Tally, Sidney Norman 918
W. A. Grieves 920
Klondike "Rush" Scenes 922
The Alaska Treasure Ship 923
View of Golden, Colorado; General Grant and Party During Visit to Consolidated Virginia-California Mine; The Lee Mountain Mine; Old Camp of Mercur, Utah; Historic Picture of Helena, Montana; Old Highland Boy Smelter at Murray, Utah 925
George H. Cushing 927
E. R. Coombes 928
Members of Coal Mining Branch, Standardization Division 929
Members of Metal Mining Branch, Standardization Division 931
Cleveland's Public Square 932
Herbert Wilson Smith 941
McK. W. Kriegh 943
Mining Industry's Leaders as They Appeared 25 Years Ago:
Frontispiece of Section 945
Charles M. Schwab, John A. Topping, William Boyce Thompson, Elbert H. Gary, Carmi A. Thompson, George H. Crosby 946
W. J. Loring, D. W. Brunton, D. C. Jackling, Walter Douglas, E. P. Matthewson, Sidney Jennings 947
J. F. Welborn, R. C. Gemmell, Norman Bridge, Edwin Ludlow, P. H. Penna, W. L. Saunders 948
Carl Scholz, Albert Nason, S. Pemberton Hutchinson, H. N. Taylor, T. H. Watkins, Samuel A. Taylor 949
William Loeb, Jr., W. J. Olcott, A. C. Dinkey, George Wingfield, William A. Clark, E. W. Parker 950
Bruce C. Yates 955
Chas. W. Potts 957
Early View of Utah Copper Mines; Placer Mining in Last Chance Gulch in 1887; View of Trinidad, Colorado, in 1881 959
An Extinct Iron Horse 963

Page

Ira L. Smith 987
Francis S. Peabody 988
Aaron A. Sargent 992
Interior Department Building 993
Benjamin Franklin Rice 994
The Servant of Industry 995
Senator Miles Poindexter 997
George H. Bailey 998
E. H. Pullman 1001

FEATURE ARTICLES

The Human Equation in Mining—E. R. Coombes 919
Alaska Makes New Start in Life—Edward B. Swanson 923
Coal's Passage Under—George H. Cushing 926
A Résumé of Twenty-five Years in Mining—Henry M. Payne 933

Bituminous Coal	933	Sulphur	973
Petroleum	936	Tungsten	975
Anthracite Coal	937	Aluminum (and bauxite)	976
Iron	939	Barytes	977
Copper	965	Chromite	978
Lead	967	Graphite	979
Silver	968	Magnesite	981
Gold	969	Molybdenum	982
Zinc	970	Nickel	982
Manganese	971	Pyrites	984
Potash	972	Vanadium (and uranium)	985

Summary 986

The Tariff and the Mining Industry—Herbert Wilson Smith 941
Tax Reforms and Their Unjust Tendencies—McK. W. Kriegh 943
Seven Avenues into the Future of Mining—W. J. Loring 951
California Metal Association Report—Robert I. Kerr 952
The Future of the Silver Mining Industry—Sidney J. Jennings 953
The Future of the Gold Mining Industry—Bruce C. Yates 955
The Future of the Sulphur Industry—Raymond F. Bacon 956
The Future of the Domestic Manganese Industry—Chas. W. Potts 957
Politics Not Yet an Economic Solvent—Harry N. Taylor 958
The Future of the Anthracite Coal Industry—S. D. Warriner 960
The Relationship of Railroads to Mining—Ira L. Smith 961
New Uses of Zinc—S. S. Tuthill 964
Mr. Peabody's Bequest to Coal—George H. Cushing 988
The Relationship between Laws and Mining—J. W. Thompson 991
Report of the Utah Chapter—A. G. MacKenzie 994
Motor Transportation and the Mining Industry—Windsor T. White 995
Character Study of Senator Poindexter—Ira L. Smith 997
Oil Shale in Russia—Victor C. Alderson 990
Review of the Year in Legislation—George H. Bailey 998

NEWS

Mining Congress Celebrates 25th Anniversary 909
To Develop Southern Mineral Empire 910
List of Exposition Exhibitors 916
Mining Exposition Is Essential Establishment 917
Western Division Is Organized 918
Report of New Mexico Chapter 921
The History of Standardization in Mining 928
Cleveland as the Convention City 932
Coal Export Committee Report 954
Depletion Ruling Issued 958
Brick Kiln Tests 958
Hunting News in the Wilds of Washington 987
African Gold Mines Are Prospering 996
Report on Sulphur Dioxide Studies 996
New Platinum Analysis Method 996
Moving the Capital to the Mining Man's Door 1001
Coal Analyses Results 1001
National Legislation 1002

Published every month by the American Mining Congress, Washington, D. C.

OFFICERS

WILLIAM J. LORING
President

DANIEL B. WENTZ
1st Vice President

E. L. DOHENY
2d Vice President

THOMAS T. BREWSTER
3d Vice President

J. F. CALLBREATH
Secretary

DIRECTORS

BULKELEY WELLS, *Denver, Colo.*
DANIEL B. WENTZ, *Philadelphia, Pa.*
JOHN C. HOWARD, *Salt Lake City, Utah*
THOMAS T. BREWSTER, *St. Louis, Mo.*
H. W. SEAMAN, *Chicago*
SIDNEY J. JENNINGS, *New York City*
HUGH SHIRKIE, *Terre Haute, Ind.*
ROBERT LINTON, *New York City*
JAMES S. DOUGLAS, *Douglas, Ariz.*
E. L. DOHENY, *Los Angeles, Calif.*
CARL SCHOLZ, *Charleston, W. Va.*
WILLIAM J. LORING, *San Francisco, Cal.*

STAFF

GEORGE H. BAILEY
Counsel

HERBERT WILSON SMITH
War Minerals

E. C. PORTER
Convention Manager

McK. W. KRIEGH
Tax Division

E. H. PULLMAN
Information Service

IRA L. SMITH
Editor
Mining Congress Journal

E. R. COOMBES
Business Manager,
Mining Congress Journal

Entered as Second Class Matter January 30, 1915, at the Postoffice at Washington, D. C.

The Roessler & Hasslacher Chemical Company

709-717 Sixth Avenue
NEW YORK, N. Y.

Works:
PERTH AMBOY, N. J. NIAGARA FALLS, N. Y. ST. ALBANS, W. VA.

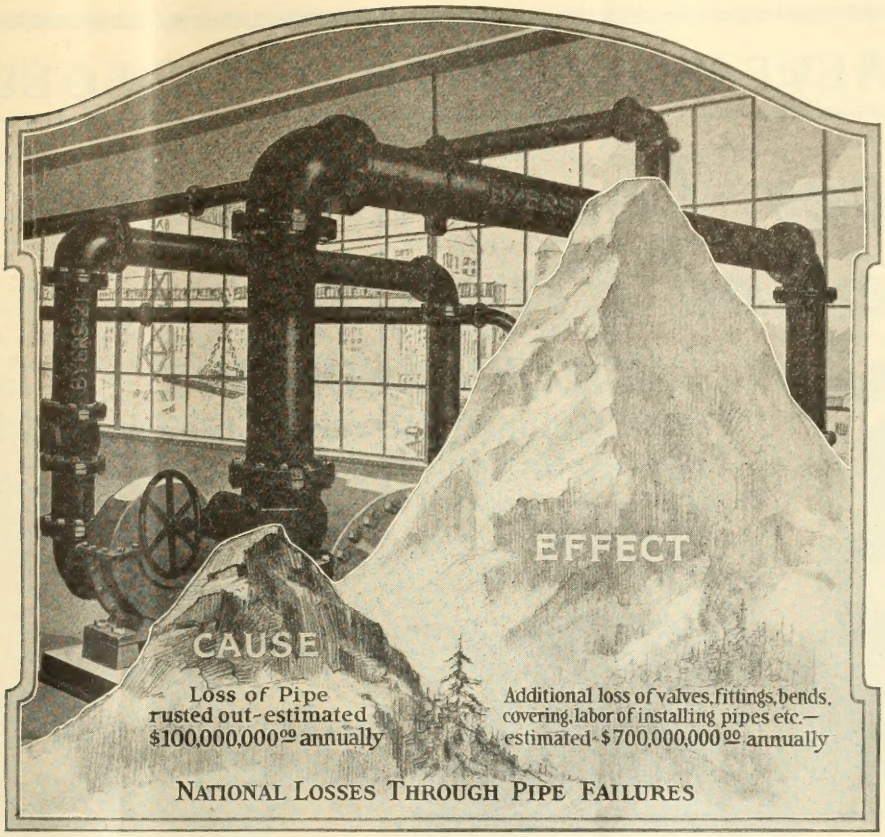
CYANEGG
R&H C Co
TRADE MARK

Cyanide of Sodium 96-98%

Cyanogen contents 51-52%

"Cyanegg"

or Cyanide of Sodium 96-98% In egg form, each egg weighing approximately one ounce


EFFECT
CAUSE
Loss of Pipe rusted out-estimated $100,000,000.00 annually
Additional loss of valves, fittings, bends, covering, labor of installing pipes etc.—estimated $700,000,000.00 annually
NATIONAL LOSSES THROUGH PIPE FAILURES

Look for the Name and Year Rolled in Every Length

Cause and Effect

The Nation's annual loss through corrosion of welded pipe is probably close to $100,000,000.00. Multiply this amount by seven, and you arrive at the concurrent loss of fittings, valves, cocks, gaskets, bends, labor and other items in a pipe installation. This does not include allowance for idle time or damage to property attendant upon many pipe failures.

Corrosion, while not preventable, may be greatly retarded by the use of Byers genuine wrought iron pipe. Its life is recognized to exceed that of ordinary black or galvanized pipe by 100 per cent up to 500 per cent, while in cost it adds but five to ten per cent to the average pipe system.

If you would avoid the big losses and annoyances caused by the use of cheap pipe, investigate past performance records of iron and steel pipe. (Ask for Byers Bulletin No. 27, 30 and 32.) Then look into the Analyses of Pipe Installation Costs, presented in Byers Bulletin No. 38.

Byers Bulletin No. 38 contains cost analyses of a variety of plumbing, heating, power, and industrial pipe systems, with notes of corrosive conditions. Sent free on request.

A. M. BYERS COMPANY, PITTSBURGH, PA.

Established 1864

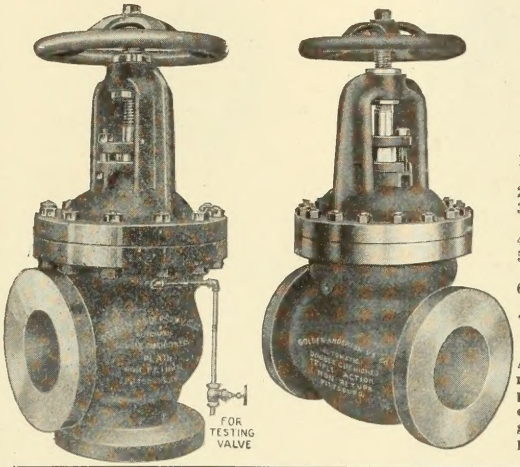
New York Philadelphia Boston Cleveland Chicago Houston Tulsa Los Angeles

BYERS PIPE

GENUINE WROUGHT IRON

"EVERY VALVE SOLD WITH AN ABSOLUTE

The Valves That Safeguard "Life and Property"



GOLDEN-ANDERSON

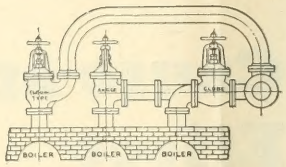
Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves

1st. **Prevent expensive shut-downs**—Automatically close in case of boiler or steam line ruptures.
2nd. **Make back flow of steam impossible.**
3rd. **Equalize pressure** between boilers, automatically—quickly pay for themselves in reduced coal bills alone.
4th. **Absolutely protect** men inside of "dead" boilers.
5th. **Valves fitted** with "Double Corliss" dashpots. Absolutely cushion valve—no hammering or sticking.
6th. **Provide for every contingency** by "automatic" testing in service feature—valves closed from floor to remote points.
7th. **Heaviest and most correct** mechanically-constructed and operated automatic valves made.

Also made in plain non-return style for protecting the boilers only. Angle, globe and elbow pattern.

"No Shut-Down When A Tube Bursts"

4100 Double Extra Heavy Valves Ordered by the Large Iron and Steel Companies

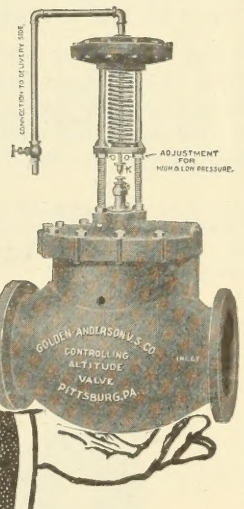


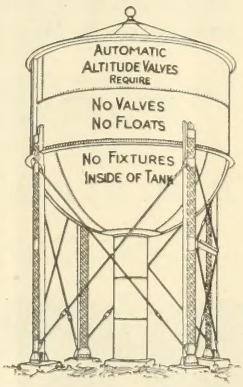
Install Water Meters—Certainly—But First

Golden-Anderson

Automatic Cushioned Controlling Altitude Valves

to stop waste at the tanks





Stop overflow from your tanks, standpipes, reservoirs. Stop waste of water that *never gets near the meters* if it runs out of a tank where the water level is not controlled, *automatically!* Use GOLDEN-ANDERSON Automatic Cushioned Controlling Altitude Valves for automatically maintaining Uniform Stage of Water in Tank, Reservoir, or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks.

"Three Ways of Closing These Valves."
1st. Automatically, by Water.
2nd. By Electricity, if Desired.
3rd. By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so constructed as to "work both ways" on a single line of pipe.
No valves or fixtures inside or outside. Sizes to 30 inches.

"Hosts of References"
Valves cushioned at all times by air and water.
No water hammer or bursting mains.

"Made with stop starter attachment for centrifugal pumps"

GOLDEN-ANDERSON VALVE SPECIALTY

GUARANTEE" "HOSTS OF REFERENCES"

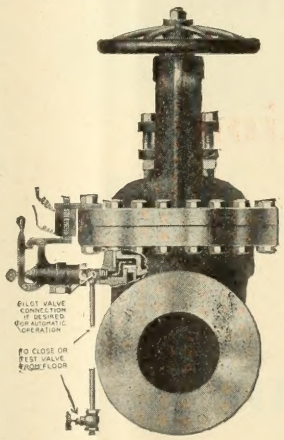
Golden-Anderson Pat.

Cushioned, Combined Throttled and Automatic Engine Stop Valves

Provide Against Runaway Engines and Disastrous Accidents

will enable you to instantly stop the steam flow to a runaway engine automatically or in case of any emergency from any remote point.

1. Operate by either electricity or steam.
2. Can be tripped by hand, or closed by wheel like ordinary stop valve.
3. Double Cushioned Corliss Dash Pot positively does away with hammering, sticking and chattering.
4. Double extra heavy in construction.
5. Suitable for all pressures, without additional adjustment.



Golden-Anderson

Patent Automatic Double Cushioned Check Valve

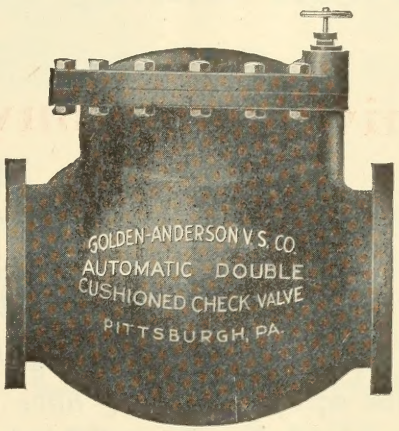
Automatically prevents reverse flow of pressure.

Perfectly cushioned to prevent shock or hammer.

Especially adapted for water works to prevent disastrous reverse flow of pressure due to pumps stopping.

Arranged so that quick or slow operations may be obtained.

Sizes to 30 in., Angle or Globe



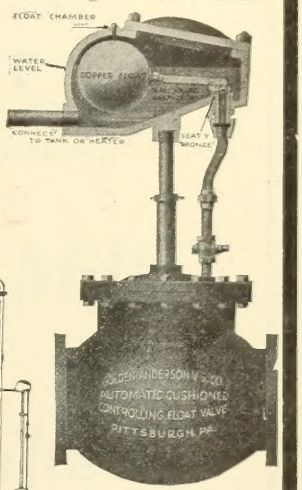
Prevent the Needless Waste of Good Feed Water

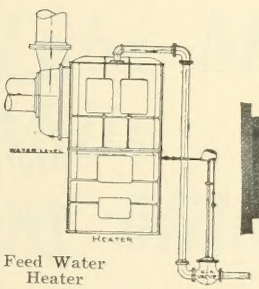
Flooding your feed water heater with excess make-up water, causes waste of good heat units down the overflow. Safeguard against this needless loss by replacing your present float valves with

GOLDEN-ANDERSON

Patent Automatic Cushioned Controlling Float Valves

1. They carry a constant water level in feed water heaters by perfectly controlling the flow of make-up water.
2. Operated by protected enclosed copper float.
3. Cushioned by both air and water.
4. Operate without hammering, sticking or chattering. No metal-to-metal seats.
5. Made angle or straightway.





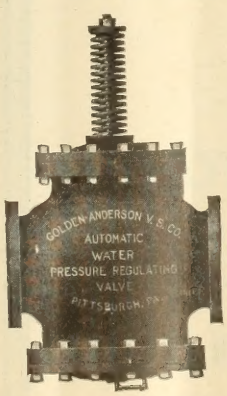
Feed Water Heater

To Insure An Absolutely Constant Reduced Water Pressure

To eliminate annoying fluctuations in the water pressure on your service mains your plant should be equipped exclusively with

Golden-Anderson

Patent Automatic Cushioned Water Pressure Reducing Valves



1. Very simple in design.
2. Easily adjusted from the outside to maintain the desired pressure and stay adjusted without further attention.
3. Fitted with patent safety piston that insures positive operation.
4. Positively cushioned by water and air. No pounding, surges or shock.
5. Can be controlled from distant points by electricity if desired.

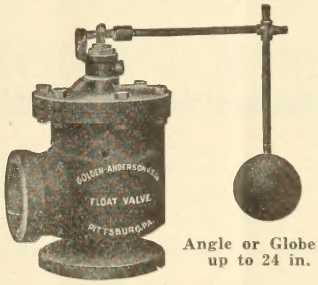
For Accurately Controlling Water Inflow to Tanks

To positively prevent the rise or fall of water level beyond a predetermined maximum and minimum in your open tanks the supply pipes should be fitted with

Golden-Anderson

Patent Automatic Cushioned Float Valves

1. Absolutely control the water level in open tanks, reservoirs, standpipes, etc., and prevent water waste down the overflows.
2. The most positive and durable float valve made.
3. No metal-to-metal seating.
4. Can be adjusted to operate quickly or slowly.
5. Made for high or low pressure.
6. Made with heavy iron, body bronze mounted.



Angle or Globe up to 24 in.

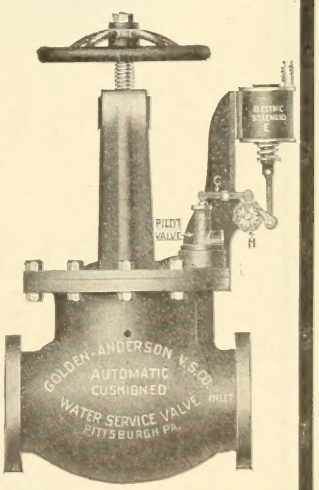
To Be Sure of Abundant Water Pressure in Case of Fire

You cannot afford to take chances in such an emergency. For an assured water pressure when you want it, your service mains need

GOLDEN-ANDERSON

Patent Cushioned Water Service Valves

1. These valves are especially designed for fire protection to quickly build up full water pressure.
2. Can be opened and closed instantly from distant points by electricity.
3. Current is on only a few seconds thereby preventing waste.
4. Can be fitted with either d.c. or a.c. solenoid.
5. Perfectly cushioned by water and air. Positively no metal-to-metal seating.
6. Can be closed by hand.



COMPANY, 1304 FULTON BLDG., PITTSBURGH, PA.

The National Exposition

of

Mines & Mining Equipment

To be held under the auspices of

The American Mining Congress

at its

25th Anniversary Convention

More than 150 of the leading manufacturers of mining machinery and equipment will have on exhibit at the PUBLIC HALL, CLEVELAND, OHIO, *their latest labor-saving, cost-reducing equipment. Everyone interested in mining is invited to attend the convention and inspect this marvelous assemblage of machinery.*

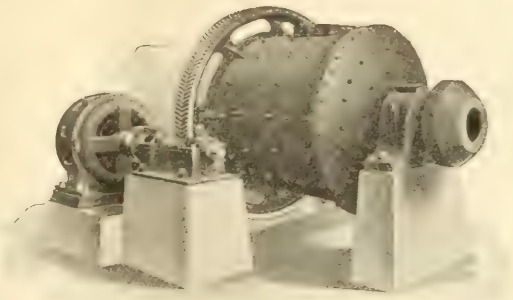
Do not forget the date:

October 9-14, 1922

PUBLIC HALL CLEVELAND, OHIO

ENDURINGLY EFFICIENT

TRAYLOR MILLS



Scientific Design
Smooth in Operation
Full Capacity Continuously
Sparing in Use of Power
Economically Maintained

Ball Mills *Tube Mills*
Combination Mills
Three Compartment Mills
Rod Mills

Every Traylor Mill is built in the well-known, superior Traylor way—with every tested improvement—with all features which make for economy, efficiency and facile operation and repair.

WET OR DRY — COARSE OR FINE
EVERY SERVICE — ANY CAPACITY

Write our nearest Office for Bulletin 103-J

TRAYLOR ENGINEERING AND MANUFACTURING COMPANY
ALLENTOWN, PENNA.

New York 30 Church St. | Pittsburgh 1133 Fulton Bldg. | Chicago 1414 Fisher Bldg. | Los Angeles Citizens Nat. Bank Bldg. | Seattle 815 Alaska Bldg.

New Orleans 1215 New Hibernia Bank Bldg. | Salt Lake City 111 Dooly Bldg. | Timmins, Ont., Can. Moore Block

Truck and Tractor Division: Cornwells, Penna.

Export Department: 104 Pearl St., New York City. Cable Address, "Forsaltra"

International Machy. Co. Santiago, Chile | W. R. Grace & Co. Lima, Peru | International Machy. Co. Rio de Janeiro, Brazil

SILVER ANNIVERSARY CONVENTION

The American Mining Congress

Celebrating 25 Years of Constructive Service to the Mining Industry

EVERY MINING MAN IN THE UNITED STATES SHOULD PLAN TO ATTEND THIS GREAT CONFERENCE, AND GET BEHIND THE PLATFORM IT WILL ADOPT IN RELATION TO:-

1. **Taxation of Mines**
2. **Governmental Interference with Private Business**
3. **A Federal Securities Act**
4. **Revision of our Mining Laws**
5. **Standardization of Mining Methods, Machinery and Equipment**
6. **A Platform for Industrial Cooperation**

PUBLIC HALL

October 9-17, 1922 ***Cleveland, Ohio***

Compliments of

Mexican Petroleum Company, Limited

Huasteca Petroleum Company

Pan American Petroleum
and Transport Company

120 BROADWAY - - - NEW YORK

America's Greatest Waste

is the prevalent use of unsubstantial, short-lived materials —in industry and the home alike.

Waste's most able aid is Rust—

Rust ruins more than $600,000,000 worth of the metal work on American homes annually. Think of it! *Six times as much property as is consumed by fire.*

The rust-loss in industrial buildings undoubtedly will be found to be as large or larger than the rust-loss in homes.

Nor is that all. Waste through the use of rusting materials in machinery and other equipment is quite as great as that in the buildings which house it. Then, too, there is the serious loss caused by manufactured articles themselves being spoiled by contact with rusted machine parts.

The *indirect* losses due to rust are found in the money frittered away in expensive but futile attempts to thwart rust—money spent for repairing, coating, plating, dipping, galvanizing, and other costly makeshifts.

The total cost of rust may well be several billion dollars a year.

Copper and Brass are entirely unaffected by rust. For every trouble-ridden year in the short life of ordinary metals, Copper or Brass gives a decade of repair-proof, trouble-free service.

Copper and Brass are cheaper because you pay for them only ONCE

COPPER & BRASS
RESEARCH ASSOCIATION
25 Broadway - New York

IN THE GREAT INDUSTRIAL FIELDS, chemists and engineers constantly are uncovering uses for the Everlasting Metals, and it is small wonder that a full, up-to-date knowledge of the uses and value of Copper Brass and the Bronzes is possessed only by research engineers.

Believing that business executives will gladly avail themselves of ways to improve their processes, products and machines, the Copper and Brass Research Association offers the services of its engineering staff. Write to the Manager of the Copper and Brass Research Association, 25 Broadway, New York

These Are The Companies

which now comprise the Copper and Brass Research Association. They are telling the public of the wear-giving, everlasting properties of Copper and Brass — a task which is most economically accomplished by a concerted effort of the industry as a whole.

Producer Members— who mine or refine Copper

American Smelting & Refining Co.
Anaconda Copper Mining Company
Arizona Commercial Mining Co.
Braden Copper Company
Calumet & Arizona Mining Company
Calumet & Hecla Mining Company
Chile Exploration Company
Chino Copper Company
Copper Range Company
The East Butte Copper Mining Co.
Greene Cananea Copper Company
Inspiration Consolidated Copper Co.
Kennecott Copper Corporation
Miami Copper Company
Mother Lode Coalition Mines Co.
Nevada Consolidated Copper Co.
New Cornelia Copper Co.
North Butte Mining Company
Old Dominion Company
Phelps Dodge Corporation
Ray Consolidated Copper Co.
Shattuck Arizona Copper Company
United Verde Extension Mining Co.
Utah Copper Company
Utah Consolidated Mining Company

Manufacturer Members— who fabricate and distribute Copper and Brass products

Anaconda Copper Mining Co., Anaconda Sales Co.
Main Office: 25 Broadway, New York.

Bridgeport Brass Company
Main Office: Bridgeport, Conn.

Chase Metal Works (Owned by the Chase Companies, Inc.)
Main Office: Waterbury, Conn.

U. T. Hungerford Brass & Copper Co.
Main Office and Warehouse: 80 Lafayette St., New York.

C. G. Hussey & Co.
Main Office: Pittsburgh, Pa.

Michigan Copper & Brass Co.
Main Office: Detroit, Mich.

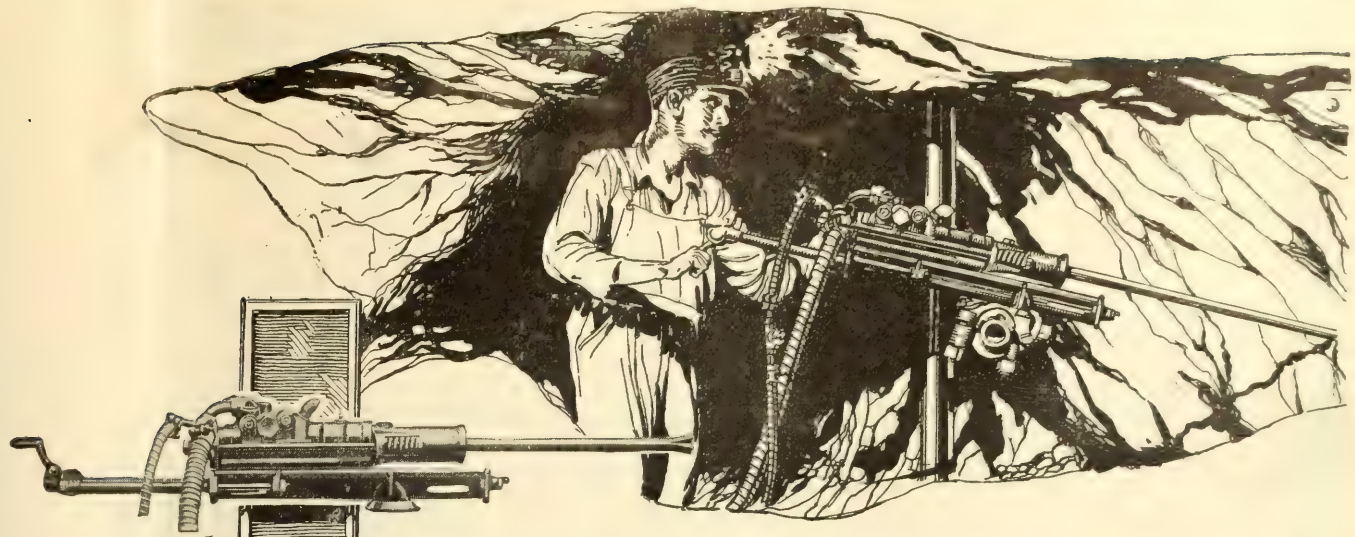
The National Brass & Copper Co.
Main Office: Lisbon, Ohio

New England Brass Co.
Main Office: Taunton, Mass.

Rome Brass & Copper Co.
Main Office: Rome, N. Y.

Scovill Manufacturing Co.
Main Office: Waterbury, Conn.

Taunton-New Bedford Copper Co.
Main Office; Taunton, Mass.



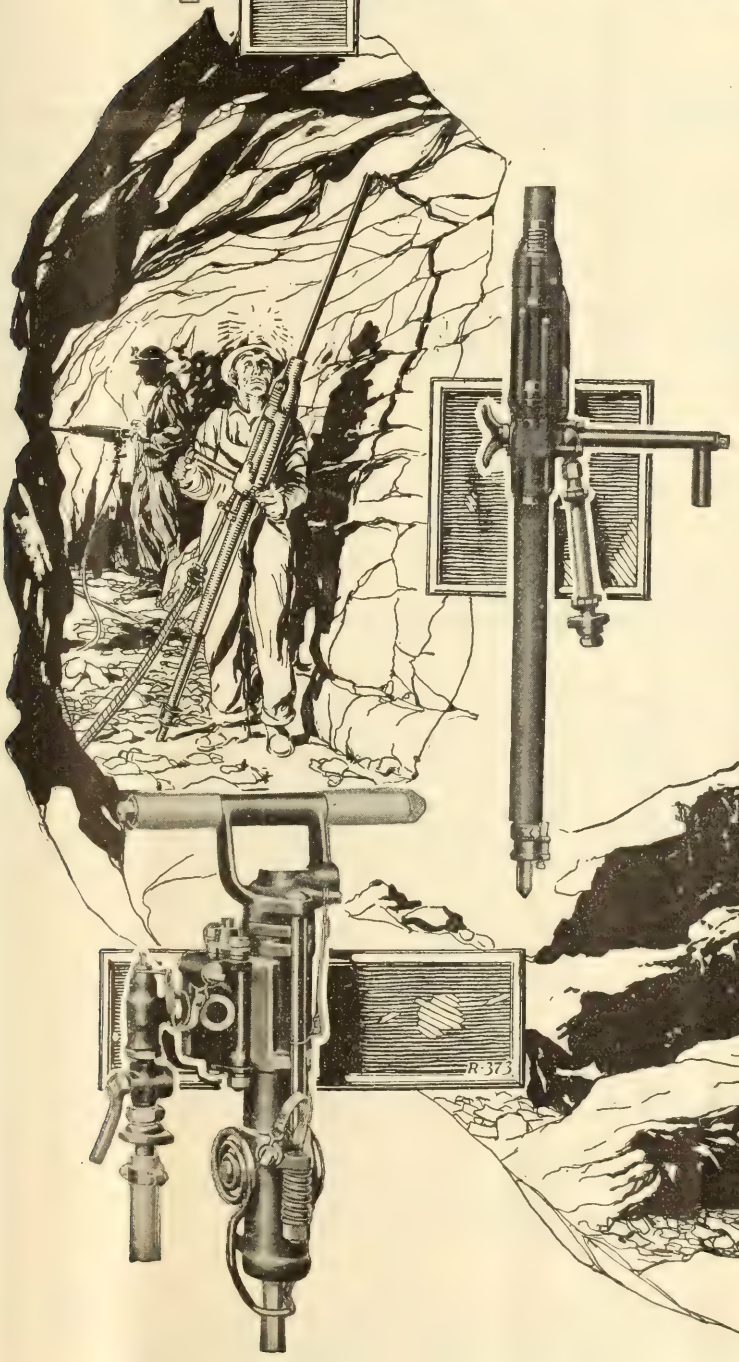
A Drill for Every Duty

THE Ingersoll-Rand Company manufactures a very wide variety of rock drills from the little 21½-lb. BAR-33 "Jackhamer" for light work around industrial plants to the large 1250-lb. K-64 Submarine Drill—and everything in between. Each of the many machines is designed for a specific duty and the entire range of drills covers every phase and type of rock drilling.

I-R engineers are always ready to consult with you on your particular rock-drilling problems and suggest the type and size of machine that will do your work most efficiently.

It will pay you to get the right drill for your job and to remember that I-R makes a drill for every job.

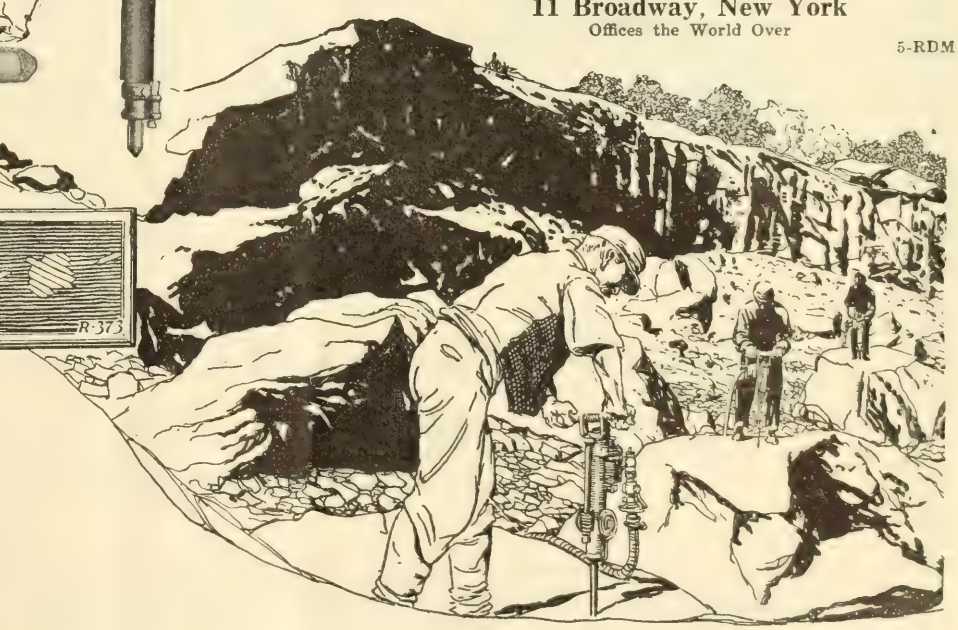
Request descriptive bulletins



Ingersoll-Rand

11 Broadway, New York
Offices the World Over

5-RDM



INCREASED FOOTAGE
DECREASED BREAKAGE

What Every Mine Manager Desires to Obtain from Drill Steel

VANADIUM

(The Master Alloy)

DRILL STEEL

Meets These Requirements

Service tests in a wide variety of rock and ore in many mining districts have demonstrated that Vanadium Drill Steel gives greater footage, holds its gauge longer than other steels, and reduces breakage by more than one-half.

There are records of double the footage, one-third the breakage and gauge held fifty per cent longer.

Write us for test reports and sources of supply

VANADIUM CORPORATION *of* AMERICA

120 Broadway, New York

849 Book Bldg., Detroit

"Kemfert" Potash

POTASH
KEMFERT
SALTS

Every American user of Potash can look back without effort to the time when he was forced to depend entirely on foreign sources of supply. It is interesting to contrast that unfavorable condition with the "Kemfert" service which is available to the American Potash buyer today.

Not only does "Kemfert" enable him to fill all his Potash requirements in his own country, benefiting by close contact with the producers and their intimate knowledge of his needs, it also gives him the finest Potash quality in the world—90 to 98 percent Potassium Chloride.

That this unequalled quality can be supplied on the basis of reliable deliveries, due to home production, is another highly important advantage.

Let us quote you on your next Potash requirements.

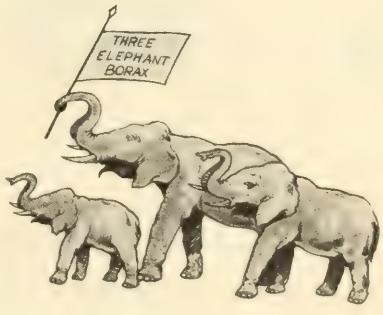
"Three Elephant" Borax

The quality standards which give "Kemfert" its dominant position in the world's Potash markets have also been applied to the production of "Three Elephant" Borax.

It is 99.5 percent pure, and to insure the maintenance of that quality an analysis is furnished with every carload shipment. "Three Elephant" Borax is supplied granulated or powdered, and in sacks or barrels. It is thus readily adaptable to any use and, wherever employed, it can be depended upon for absolutely reliable results.

The uniform purity of "Three Elephant" Borax makes it a safe and economical product to use under the most exacting conditions.

We can give early delivery dates for "Three Elephant" Borax in any quantity.



AMERICAN TRONA CORPORATION
WOOLWORTH BUILDING, NEW YORK, N. Y.

ALASKA STEAMSHIP COMPANY

SEATTLE, WASHINGTON

Freight and Passenger Service between Seattle and Alaskan Ports

Southeastern Alaska Route

Ports of Call: Ketchikan, Wrangell, Petersburg, Treadwell, Juneau, Thane, Haines, Skagway, Douglas

Southwestern Alaska Route

Ports of Call: Ketchikan, Juneau, Cordova, Valdez, Latouche, Seward, Anchorage

NOME—ST. MICHAEL ROUTE

Ports of Call: Nome, Golovin, St. Michael

Copper River and Northwestern Railway

Connecting with Alaska Steamship Company at Cordova

Daily Service to Miles and Childs Glaciers, Chitina, Kennecott and Intermediate Points

Write for Sailing Schedules, Rates, Etc., to

JOHN H. BUNCH, G. F. & P. A.

PIER 2, SEATTLE, WASHINGTON

Utah Copper Company

25 Broad Street
NEW YORK CITY

Western Office:
SALT LAKE CITY,
UTAH

COPPER

Chino Copper Company

25 Broad Street
NEW YORK CITY

Western Office:
HURLEY,
NEW MEXICO

Ray Consolidated Copper Company

25 Broad Street
NEW YORK CITY

Western Office:
RAY, ARIZONA

COPPER

Nevada Consolidated Copper Company

25 Broad Street
NEW YORK CITY

Western Office:
McGill, Nevada

CALUMET & ARIZONA MINING COMPANY

General Office: CALUMET, MICHIGAN

Mine Office: WARREN, ARIZONA

NEW CORNELIA COPPER COMPANY

General Office: CALUMET, MICHIGAN

Mine Office: AJO, ARIZONA

PHELPS DODGE CORPORATION

99 John Street = = = New York

COPPER

"C ★ Q"
Electrolytic

"P. D. Co."
Casting

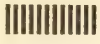
INSPIRATION CONSOLIDATED COPPER COMPANY

25 BROADWAY
NEW YORK

Mine: INSPIRATION, GILA COUNTY, ARIZONA

Greene Cananea Copper Company

25 Broadway, New York



Mines and Works:
THE CANANEA CONSOLIDATED COPPER COMPANY, S. A.
CANANEA, SONORA, MEXICO

CALUMET & HECLA MINING COMPANY OF MICHIGAN

LAKE COPPER

BRANDS

C & H—T O—S R—C L

COPPER OXIDE

Sales Agents

CALUMET & HECLA CO., Inc.

25 BROADWAY, NEW YORK

Magma Copper Company

Producers of

COPPER

Mines Located at Superior, Pinal County
Arizona

President's Office: 14 Wall Street, New York City

COPPER RANGE COMPANY

82 Devonshire Street **BOSTON, MASS.**

LAKE COPPER

SALES DEPARTMENT = = = **52 BROADWAY, NEW YORK**

UNITED VERDE EXTENSION MINING COMPANY

Mines, JEROME, ARIZONA

Smelter, CLEMENCEAU, ARIZONA

Executive Offices
233 BROADWAY, NEW YORK

OFFICERS AND DIRECTORS

JAMES S. DOUGLAS, *President*....Douglas, Arizona
GEORGE E. TENER, *Vice-President*..Pittsburgh, Pa.
LOUIS E. WHICHER, *Vice-President*.....New York
CHAS. P. SANDS, *Sec'y and Treasurer*....New York
ARCHIBALD DOUGLAS, *General Counsel*...New York
GEORGE KINGDON, *Gen'l Manager*..Jerome, Arizona
PAUL ARMITAGE.....New York
ANDREW J. PICKRELL.....Los Angeles, Calif.
R. M. RAYMOND .....New York

A Few of the Leaders that Have Made Byron Jackson Pumps

Standards of the World

Sustained effort during the past fifty years to produce pumps that would meet the requirements of the mining industry for maximum efficiency and continuous operation with a minimum of attention, has given the centrifugal and deepwell turbine pumps of the Byron Jackson Iron Works a dominating position in the markets of the world. Space limitation permits of a discussion of only a few of the standard types.

Vertical Unwatering Pump with Short Motor Barrel

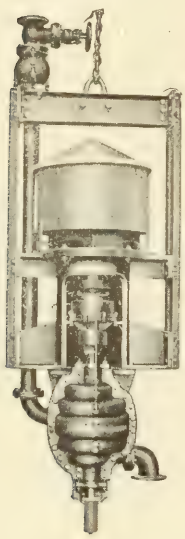


FIGURE 1
Vertical Unwatering Pump. Short Motor Barrel Construction.

This is the simplest construction of a vertical unwatering pump, requisite number of stages for any head or capacity being supplied.

Deepwell Turbine Vertical Shaft

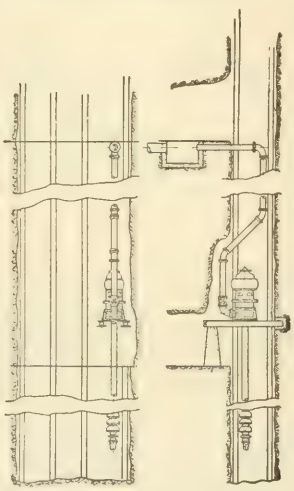


FIGURE 4
Dewatering Pump for Mine

This pump, a recent development in unwatering mine shafts, consists of a series of stages located at the bottom of mine shaft and suspended from the surface. Figure 4 illustrates the advantage of this type. Motor is set permanently above high water, eliminating shut down to permit of raising or lowering of pump. After starting, pump need not be stopped until shaft is dewatered.

Vertical Unwatering Pump with Channel Steel Frame

Where it is advisable to have a greater distance between the pump proper and the motor than is provided by Figure 1, this type (Figure 2) with channel steel frame, spacing the motor and pump 20 feet or more apart, is supplied. Recommended where necessary to safeguard motor against water damage. Both give same hydraulic performance.

Incline Shaft

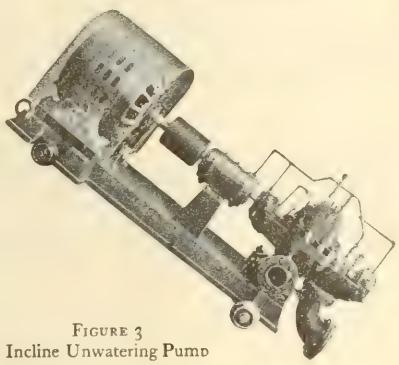


FIGURE 3
Incline Unwatering Pump

For incline work Figure 3 is furnished. Grease bearings throughout. Heavy thrust bearing between motor and pump, carrying the hydraulic thrust of pump and down thrust of motor through solid coupling between motor and pump shaft. May be operated at any angle from horizontal to vertical.

FIGURE 2
Vertical Unwatering Pump in Channel Steel Frame.

BYRON JACKSON IRON WORKS - INC.

Wherever water is to be lifted

Sharon Building - SAN FRANCISCO

LOS ANGELES VISALIA SALT LAKE CITY PORTLAND, OREGON

EXHIBITOR'S SECTION

EDITORIAL

THIS ISSUE of THE MINING CONGRESS JOURNAL is devoted to the marvelous development of the mining industry during the past twenty-five years. There is nothing, perhaps, which more clearly demonstrates that growth than the expansion of the industry producing mining machinery and equipment.

TWENTY-FIVE years ago this was a nation of potential mineral resources. We had vast deposits of high grade ores. But the almost spectacular industrial development of the country soon proved that if we were to continue to develop industrially, we must either find new properties or utilize our low grade ores. Today the future growth of the industry depends even more largely upon our ability to recover low grade ore and upon the utilization of labor-saving equipment. Whether the public shall have cheap fuel, sufficient iron to meet our steel requirements, copper to supply our industrial needs and gold to insure national stability, is now, as never before, dependent upon the ingenuity of the manufacturer.

TWENTY-FIVE years ago we had scarcely heard of such minerals as molybdenum, aluminum, graphite, barytes, sulphur, tungsten and potash. Today these are among our important mineral resources. Twenty-five years ago no one advocated the recovery of low grade copper, iron, silver, or gold. Today the manufacturer, working with the engineer and metallurgist, has given us many of our greatest sources of these metals.

THE SUCCESSFUL mine operator and manager is studying with greatest care every type of equipment that offers a possibility of reducing operating costs. The Manufacturers' Division, through the National Exposition of Mines and Mining Equipment, affords an opportunity to study and inspect a large variety of equipment designed for greater operating efficiency.

EACH YEAR it has become more apparent that a closer cooperation between the manufacturer and operator means greater advancement of the industry. The American Mining Congress, representing every branch of the mining industry, is the logical point of contact. It offers its facilities to the manufacturer and operator alike, in order that the industry may develop to its fullest extent; that the operator may pay a fair wage to labor, secure a reasonable return upon his investment, and furnish to the public its daily necessities at the lowest possible cost.

The NATIONAL EXPOSITION *of* MINES *and* MINING EQUIPMENT

TO BE HELD UNDER THE AUSPICES OF

The MANUFACTURERS' DIVISION

The AMERICAN MINING CONGRESS

OCTOBER 9-14, 1922

will be the largest, most comprehensive, and interesting exhibit of mining machinery, ever shown. More than 150 representative manufacturers will have on display their latest labor-saving, cost-reducing equipment. The 25th Anniversary Convention, The American Mining Congress, and The National Exposition, will be held in the beautiful new convention building,

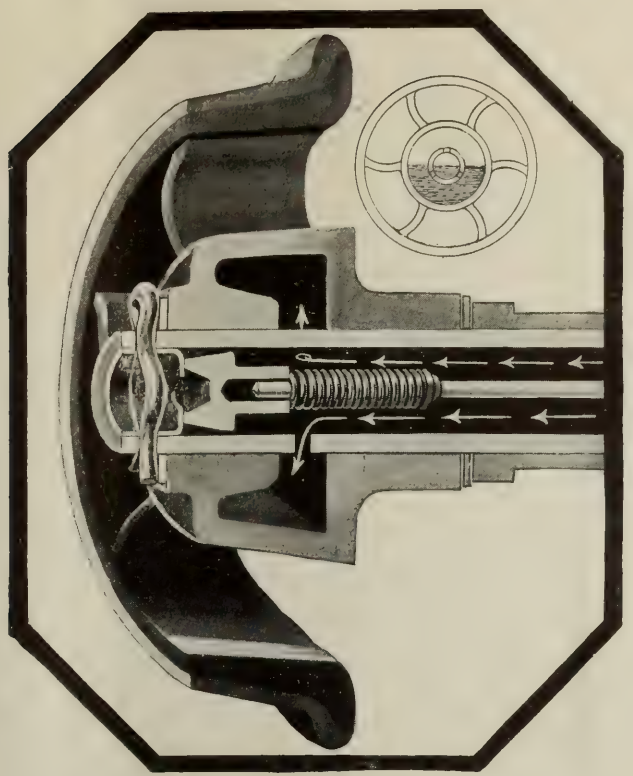
CLEVELAND, OHIO

RECENT GRANULATOR INSTALLATIONS

KIRKLAND LAKE DISTRICT, CANADA

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.



Oil flows from axle into wheel when turning

When wheel is at rest, oil flows back into axle seeking its level

Hollow Axle Trucks Make A Well-Balanced Mine Car

BY careful designing, the Hollow Axle Truck combines all the qualities demanded of a satisfactory mine truck, without over-emphasizing any one detail.

It provides a constantly lubricated bearing, without making oiling difficult.

It provides an axle 50 per cent stronger than usual, without increasing the weight of the truck.

It provides an easy-rolling mine car without complicating design.

It secures simplicity and consequently low maintenance without sacrificing advantages claimed by more complicated construction.

Experience of over eight years, covering thousands of trucks, has perfected every feature of Hollow Axle design.

Interesting literature describing the Hollow Axle Truck, and what it can do for you, will be sent you at your request.

SOUTHERN WHEEL COMPANY

St. Louis, Missouri

Birmingham, Ala. 30 Church St., N. Y.

Authorized Agents

Superior Supply Company, Bluefield, W. Va.
Norton Machinery & Supply Co., Norton, Va.
The Pennsylvania Electrical Repair Co., Pittsburgh, Pa.

Our booth is
No. 105
We hope you'll call during the convention.

Flotation Oils Produced Under Strict Chemical Control

Hercules Flotation Oils are made to conform rigidly to specifications that meet your requirements. This can be done because of the strict chemical control under which they are made.

They are tested for specific gravity, refractive index, polymerization residue, flash point, viscosity, color, and complete distillation range. Moreover, the supply is dependable.

We invite correspondence from flotation operators. Write for quotations and an interesting booklet on flotation.

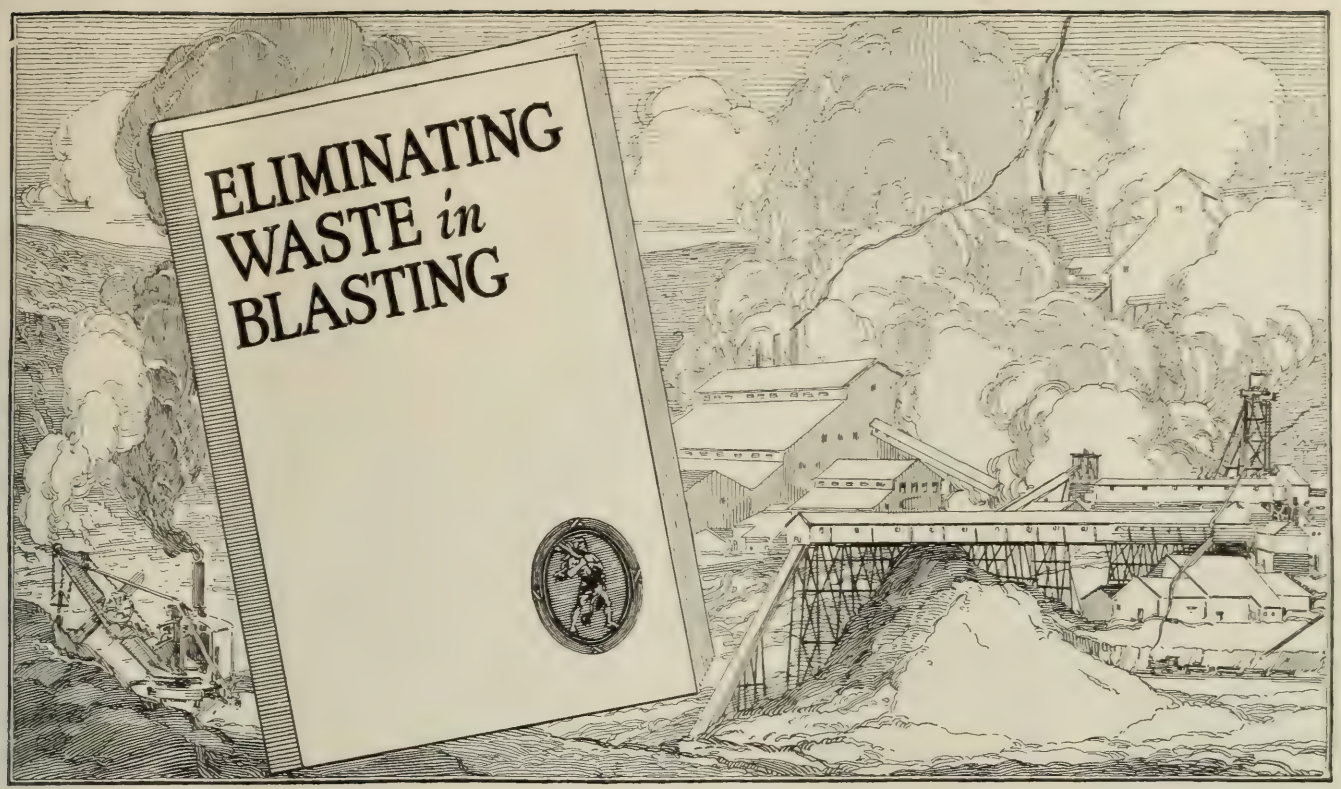
We are a charter member of the manufacturer's division of the American Mining Congress.

HERCULES Flotation Oils

Produced Under Chemical Control

HERCULES POWDER COMPANY

Allentown, Pa.	Chicago, Ill.	Hazleton, Pa.	Louisville, Ky.	Pittsburgh, Pa.	Salt Lake City, Utah
Birmingham, Ala.	Denver, Colo.	Huntington, W. Va.	New York City	Pottsville, Pa.	San Francisco, Cal.
Buffalo, N. Y.	Duluth, Minn.	Joplin, Mo.	Norristown, Pa.	St. Louis, Mo.	Wilkesbarre, Pa.
Chattanooga, Tenn.		Los Angeles, Cal.	Pittsburg, Kan.		Wilmington, Del.



Eliminating Waste in Blasting

The preparation and execution of careful plans for all drilling and blasting operations is a positive, well-defined and unescapable responsibility upon management in the industries that consume explosives.

Our book, "*Eliminating Waste in Blasting*", was written to assist users of explosives in preventing waste of time, labor, and materials. It contains chapters on Planning the Work; Drilling; Choice of Explosives; Distribution of Explosives; Advantages of No. 8 Blasting Caps; Increasing Efficiency by Use of Stemming; Preventing Waste in Firing with Fuse and Caps, and in Firing by Electricity; and on the advantages of Cordeau. It describes methods by which some contracting, quarrying and mining companies have prevented waste and reduced costs.

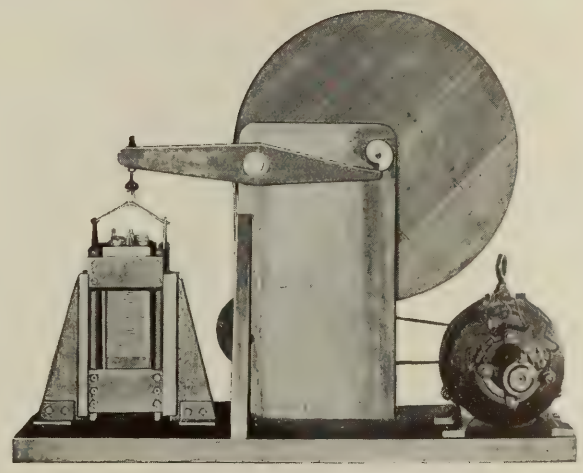
In the industries investigated by the Committee of the Federated American Engineering Societies, appointed by Herbert Hoover, management is held responsible for 50% of the waste. We are doing all we can to assist management in preventing waste in the use of explosives. You can help by telling us of ways in which you have reduced your drilling and blasting costs.

Write to our advertising department, 934 King Street, Wilmington, Delaware, for a free copy of our book, "*Eliminating Waste in Blasting*".

HERCULES

POWDER COMPANY

Allentown, Pa.
Birmingham, Ala.
Buffalo, N. Y.
Chattanooga, Tenn.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Hazleton, Pa.
Huntington, W. Va.
Joplin, Mo.
Los Angeles, Cal.
Louisville, Ky.
New York City
Norristown, Pa.
Pittsburg, Kan.
Pittsburgh, Pa.
Pottsville, Pa.
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Wilkesbarre, Pa.
Wilmington, Del.



Edison Batteries for mine service had to stand up to nearly 2,000,000 "falls" from a height of ½ inch in this machine before manufacturing was commenced.

Edison STORAGE Battery

Edison Batteries are built of steel and their internal parts are preserved in an alkaline solution.

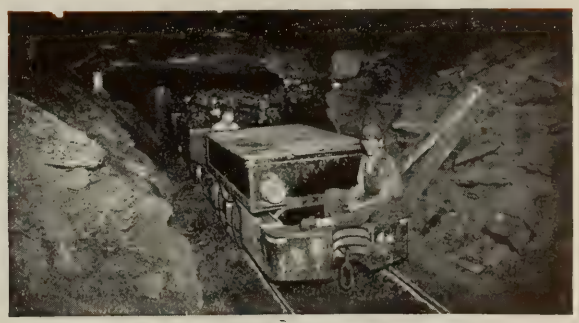
Edison Batteries are built to withstand the jars, bumps, derailments and rough service encountered by mining locomotives. Steel locomotives need steel batteries to assure maximum daily service, greater production, fewer repairs, lower maintenance and lower cost of production.

Send for illustrated Bulletin 608, which describes the Edison Battery and shows many pictures of installations.

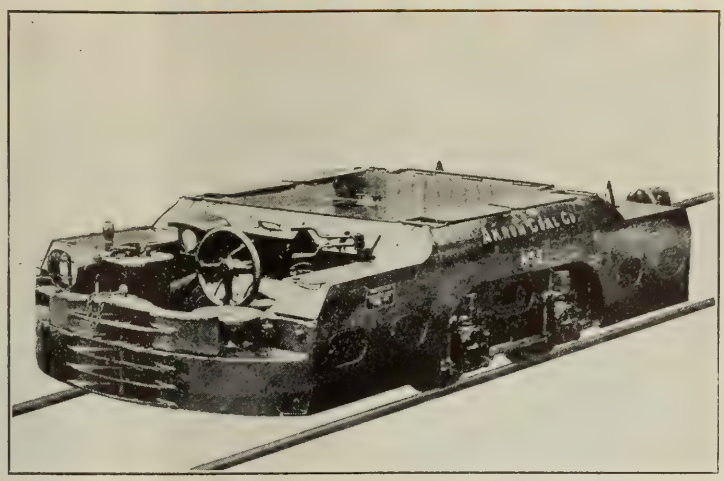
Welcome to Space 142 at the National Exposition of Mines and Mining Equipment at Cleveland, October 9-14, 1922. See the strength of the Edison Battery demonstrated.

Edison Storage Battery Company

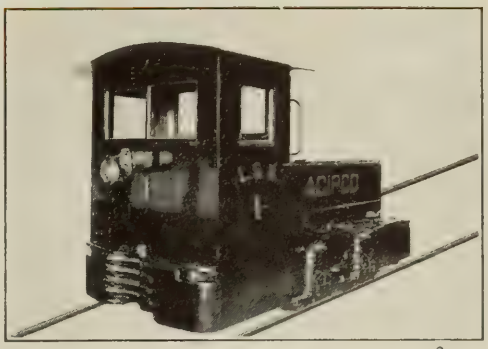
Orange, New Jersey



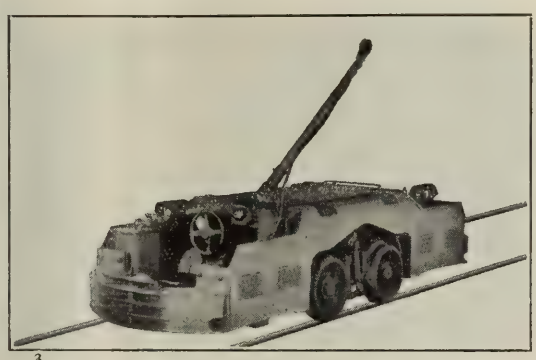
Mancha's Electric Mule



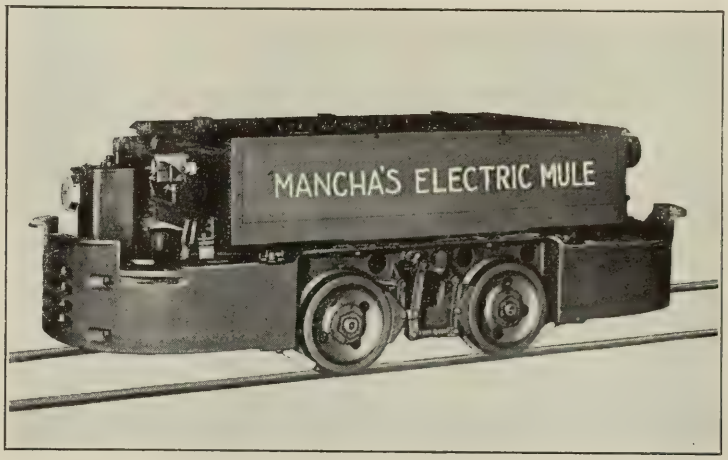
1



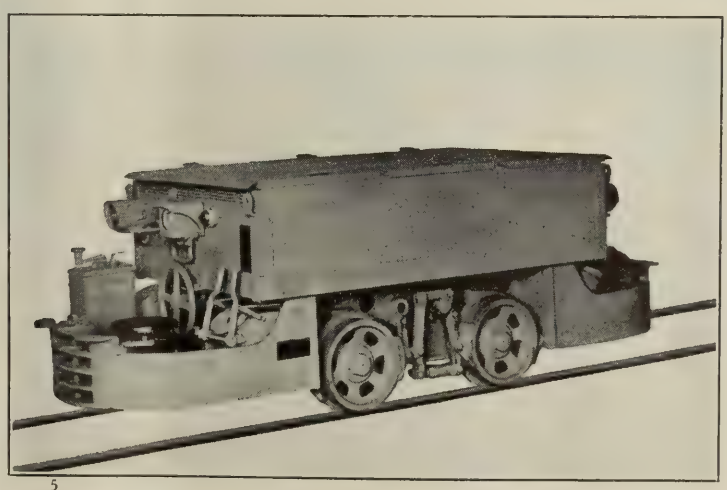
2



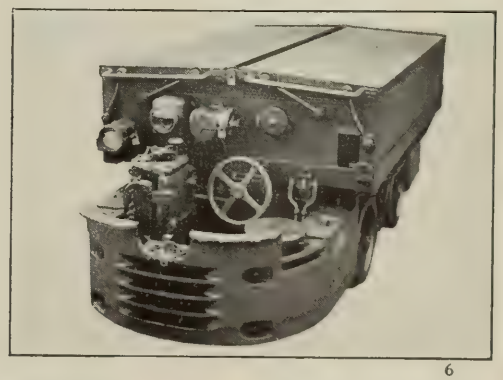
3



4



5



6

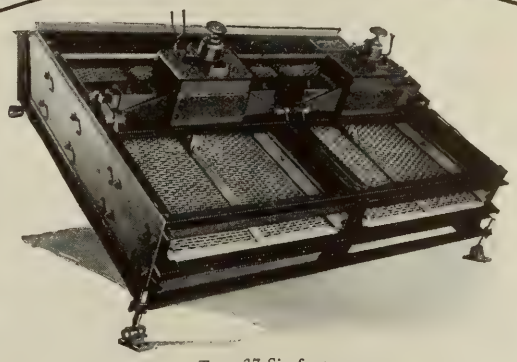
For All Purposes

Meet Us at the Convention

Mancha Storage Battery Locomotive Co.

ST. LOUIS, MO.

Representatives In All Principal Cities



Type 37 Six foot
HUM-MER *Electric* SCREEN

SEE THE
HUM-MER *Electric* SCREEN

the remarkable screening process that has made screening and crushing more profitable on more than 100 different kinds of material.

IN SPACE No. 116 and 127

The Tyler Exhibit

The W. S. Tyler Company's Exhibit will include the HUM-MER Electric Screen, Ro-Tap Testing Sieve Shaker, Tyler Standard Screen Scale Testing Sieves and Woven Wire Screens.

Visit our Laboratory

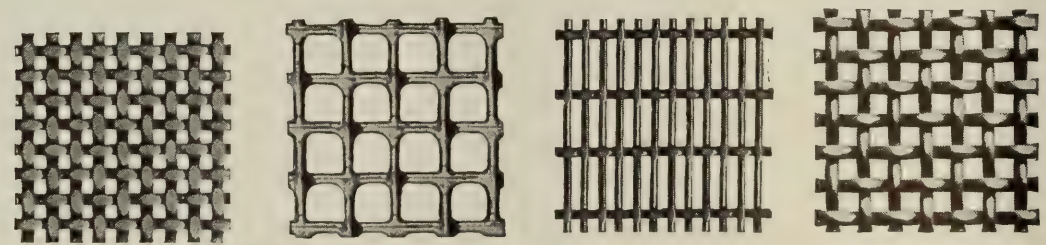
Those desiring to observe HUM-MER tests on a particular material are invited to visit the Company's laboratory (less than 10 minutes' ride from the Public Hall) where material will be passed through the HUM-MER to enable a first hand idea of the efficiency of the machine.

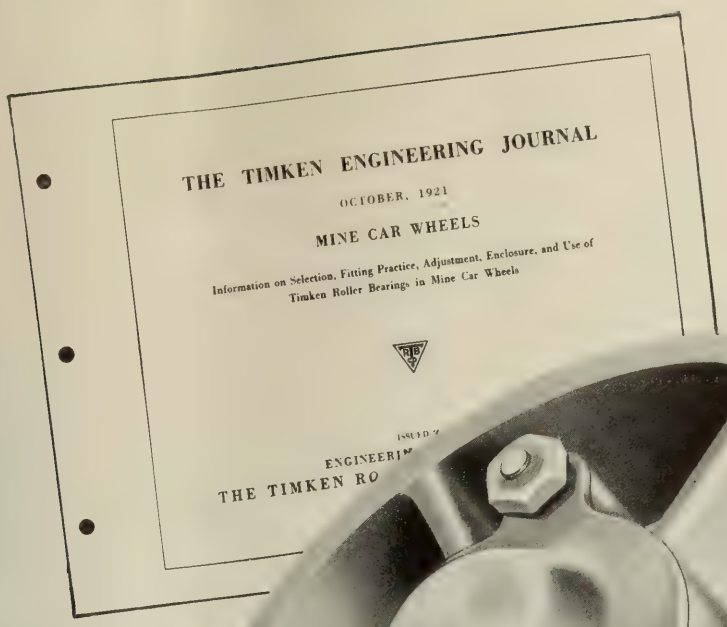
Season Guest Pass

Season Guest Passes may be obtained upon personal, telephone, or mail request from The W. S. Tyler Company's Office at 3615 Superior Ave., N. E., Telephone, Prospect 1673.

THE W. S. TYLER COMPANY, *Cleveland, Ohio*

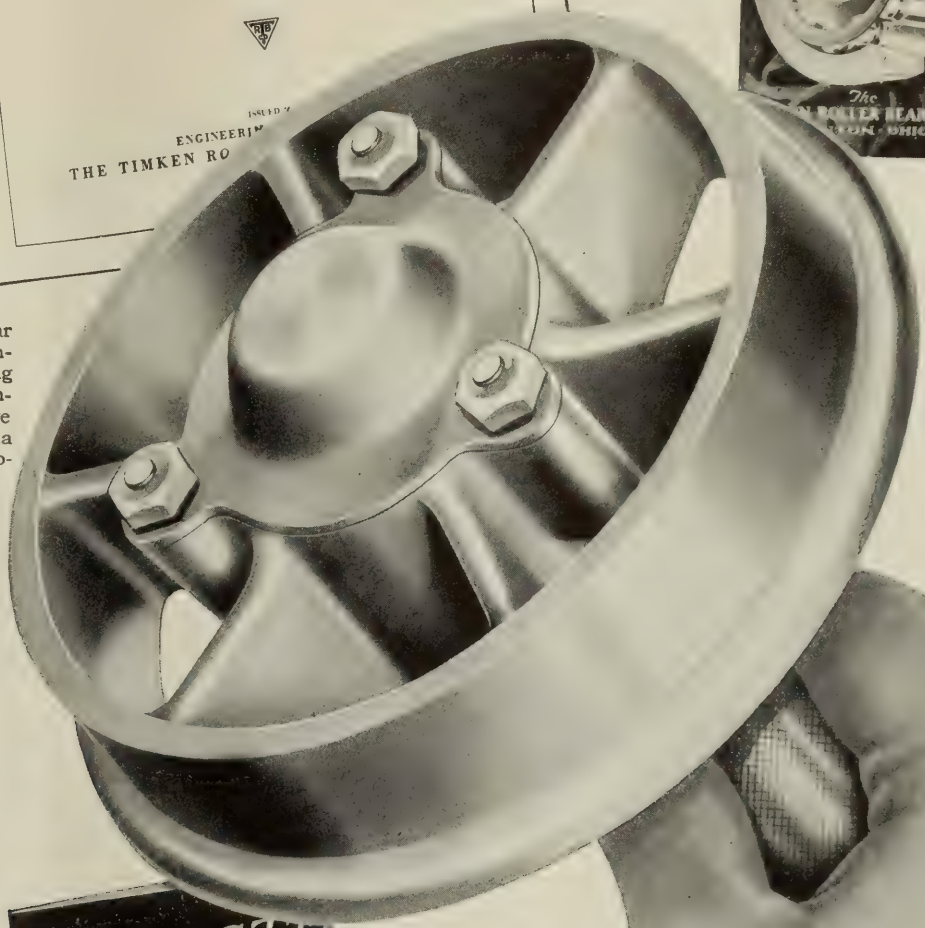
Manufacturers of **Woven Wire Screens and Screening Equipment**




THE TIMKEN ENGINEERING JOURNAL
OCTOBER, 1921
MINE CAR WHEELS
Information on Selection, Fitting Practice, Adjustment, Enclosure, and Use of Timken Roller Bearings in Mine Car Wheels

The Mine Car issue of the Timken Engineering Journal, containing authoritative engineering data on mining equipment.

"The Company Timken Keeps" shows the dominance of Timken Bearings in the Automotive Industry. Timkens will do for mine cars what they have already done for automotive vehicles.



One of the miniature working models of a mine car wheel equipped with Timken Bearings.

A booklet explaining in non-technical language, the forces that play havoc with the life of mine cars—and how to overcome them!

These and other publications, part of the Timken Industrial Advertising Campaign, contain much information of value to the mine operator. Copies are yours for the asking.

The Timken Roller Bearing Co
CANTON, OHIO

© 1922, T R B Co, Canton, Ohio

"Welcome"

Is the First Thing You'll Find at the O-B Exhibit

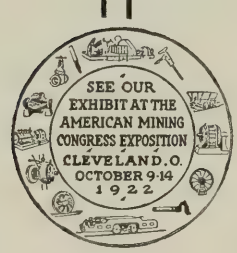
THERE will be many things to interest you at the O-B Exhibit this year. Spaces 136-137, Main Arena Floor, will have a complete display of O-B Materials.

You will want to examine the latest development in electric arc weld bonding--the new O-B AW-7 and AW-8 Rail Bonds. There will also be samples there of all the other O-B Bonds.

You will see all the different fittings which the trolley system needs--hangers, clamps, cam tip frogs, feeder wire insulators, section insulator switches, etc.

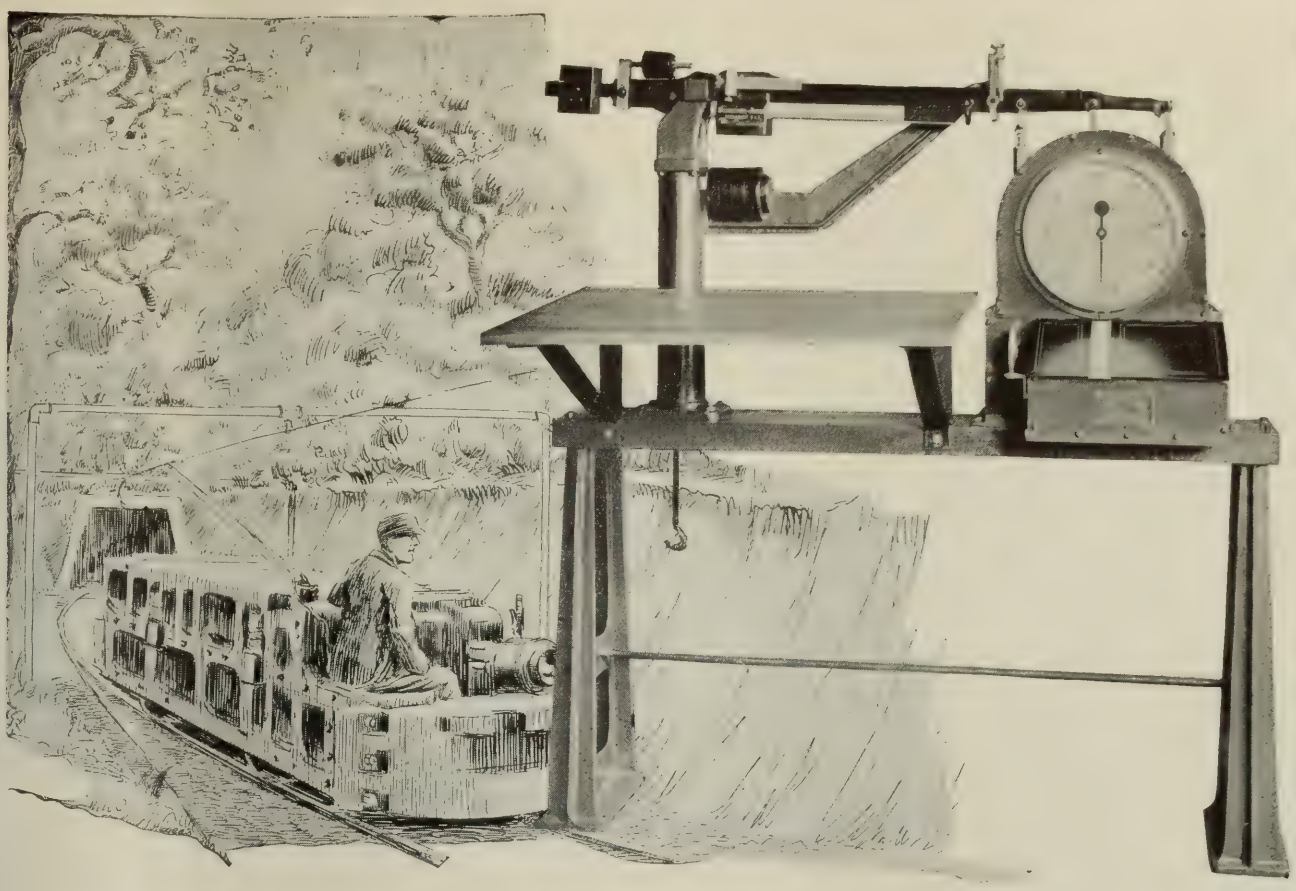
There will be plenty of things to look at and discuss. But above all there will be a cordial welcome awaiting you. Come in.

Spaces, 136-137
Main Arena Floor



The Ohio B Brass Co.
Mansfield, Ohio, U.S.A.

New York Philadelphia Pittsburgh Charleston, W Va. Chicago Los Angeles San Francisco Paris, France
Products: Trolley Material, Rail Bonds, Electric Railway Car Equipment, High Tension Porcelain Insulators, Third Rail Insulators



Weighing Service

Accuracy, definite records, knowledge instead of guesswork are details of weighing service that every operator hopes to get from his scale equipment. But with the human element which enters into most weighing, these desirable results are often hard to attain.

Hundreds of large coal companies have put their weighing on the basis of knowledge and accuracy by using Streeter-Amet Weighing and Recording Machines. The element of human fallibility never interferes with accuracy. Cars cannot come too fast, and the machine never delays production by tying up cars at the scales.

Economy and accuracy are only two of the details of value in Streeter-Amet equipment. May we point out the others?

Streeter-Amet Weighing and Recording Co.

4101-4105 Ravenswood Ave., Chicago

The Du Pont Company Announces a New Ventilation Tubing

THE Du Pont Company's century-long experience in the explosive industry has naturally led to an intimate knowledge of ventilation conditions and requirements.

As a result of long research and experiment, the Du Pont Company announces the perfection of VENTUBE—a *waterproof and fungus-proof, collapsible ventilation tubing highly resistant to the action of acids, alkalies and gases.*

VENTUBE is extremely light in weight, yet is sufficiently sturdy to withstand any mining condition. Its flexibility of application is most advantageous. It enables the operator to keep ventilation abreast of the work. At small cost, ideal working conditions may be maintained at every working face and stope.

A descriptive booklet will be sent upon request.

VENTUBE is supplied in standard lengths of 25, 50 and 100 feet and standard diameters of 8, 12 and 16 inches, with all necessary accessories. Sections equipped with Braley patent ring couplings can be coupled or uncoupled in a few seconds.

E. I. du Pont de Nemours & Co., Inc.

Explosives Department

Wilmington, Del.

Birmingham	Denver	New York
Boston	Duluth	Pittsburgh
Chicago	Huntington	Scranton
Seattle	San Francisco	

Canadian Distributors
Canadian Explosives Limited
Montreal, Canada

Exhibitor at the Twenty-fifth Annual Convention of the American Mining Congress and National Exposition of Mines and Mining Equipment, Cleveland, Ohio, October 9-14, 1922.

DU PONT
VENTUBE

A Three-Fold Service

THROUGH the past fifty years great progress has been made in the development of efficient and economical explosives. And in practically every case the du Pont Chemical Engineer has been the pioneer.

A staff of three hundred chemical engineers in the du Pont Laboratories—by painstaking research, study and experiment—are anticipating the needs of Industry for safer and more economical explosives. In the du Pont Laboratories, Low-Freezing Dynamites—eliminating the thawing hazard—were first originated and developed to their present highly efficient state.

In 1907 a Low-Freezing Ammonia Dynamite was introduced. What it has thus far saved in lives and money is inestimable.

Du Pont Explosives Service is three-fold. It assures you, first, of the rigid maintenance of du Pont quality—second, the counsel of a staff of practical explosive experts to work out your own particular problems—third, system of manufacture and distribution that guarantees quick delivery.

Put your explosives problems up to du Pont.

E. I. du Pont de Nemours & Co., Inc.
Explosives Department
Wilmington, Delaware

BRANCH OFFICES

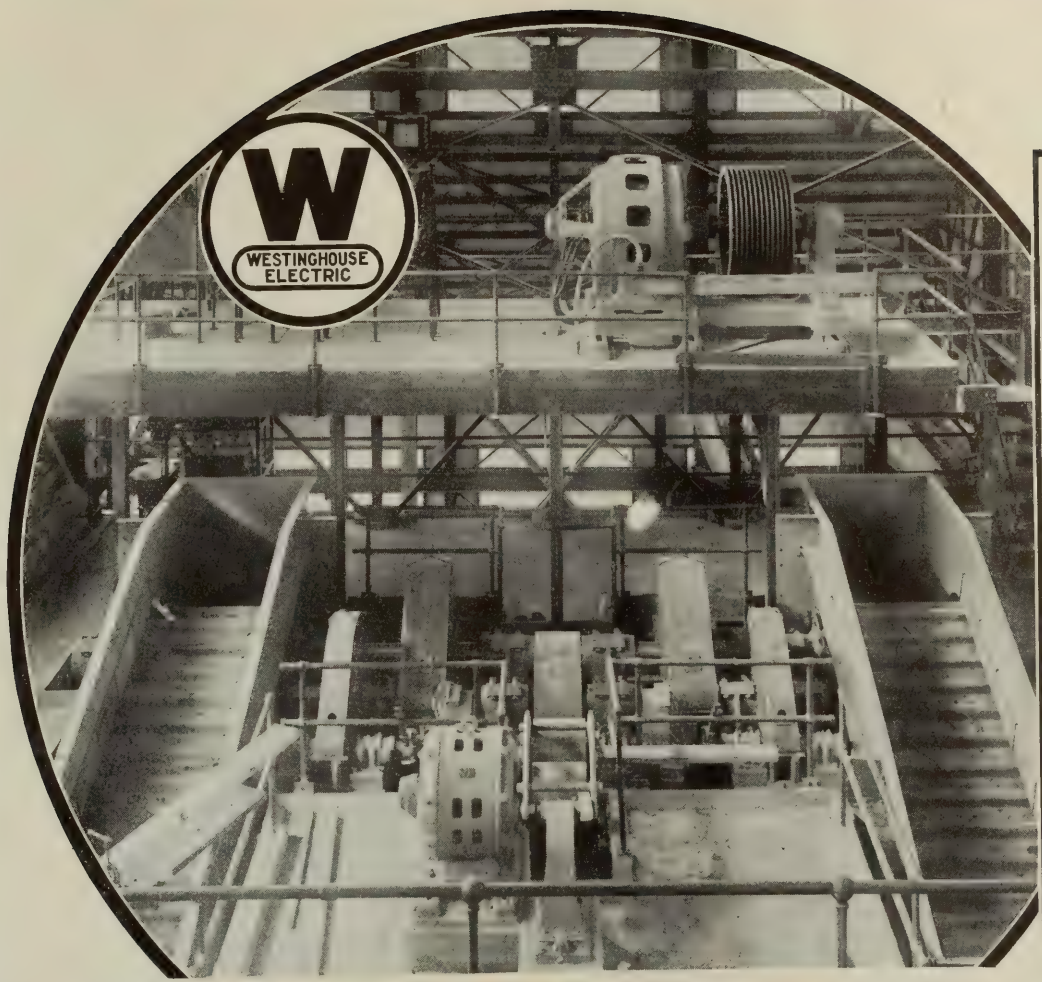
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Huntington, W. Va.
Kansas City, Mo.
New York, N. Y.
Pittsburgh, Pa.
Portland, Ore.
St. Louis, Mo.
San Francisco, Calif.
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.
Springfield, Ill.

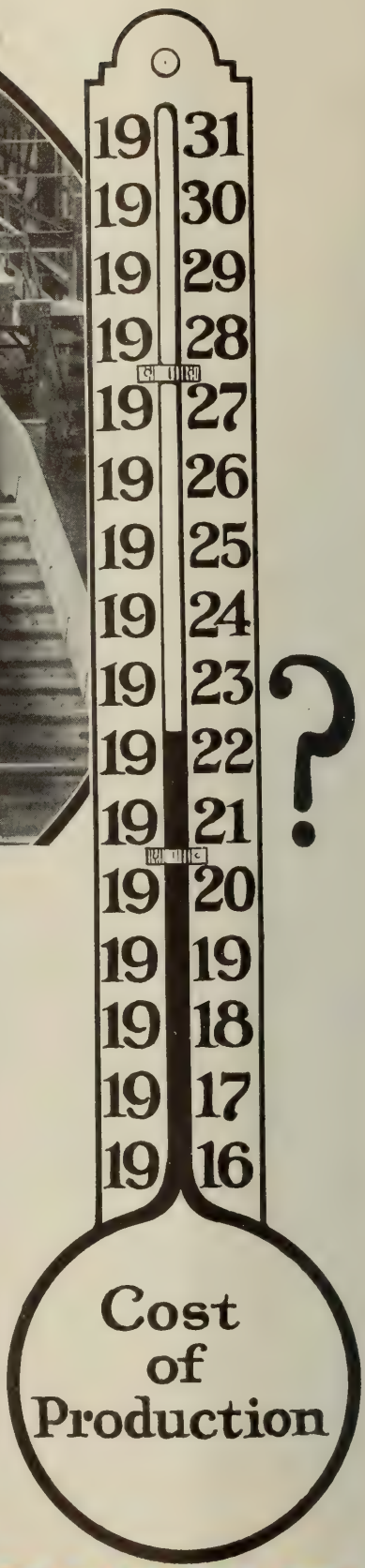
Du Pont Products Exhibit, Atlantic City, N. J.

Exhibitor at the twenty-fifth Annual Convention of the American Mining Congress and National Exposition of Mines and Mining Equipment, Cleveland, Ohio, October 9-14, 1922.

VISIT US AT
BOOTH 111
MAIN AREA

EXPLOSIVES ~ SERVICE





Up or Down?

In looking for a way to reduce production costs, you have no doubt considered the use of electricity.

When you think of electric operation, do not think of it merely as a more efficient way to apply the power that is generated in your plant or purchased from the central station.

Think rather of the conveniences of electric operation—of operations facilitated by the use of electrical apparatus. Think of speedier operation—speedier haulage.

Think of electricity as a means of reducing the cost per ton by increased output at the mine within a given time.

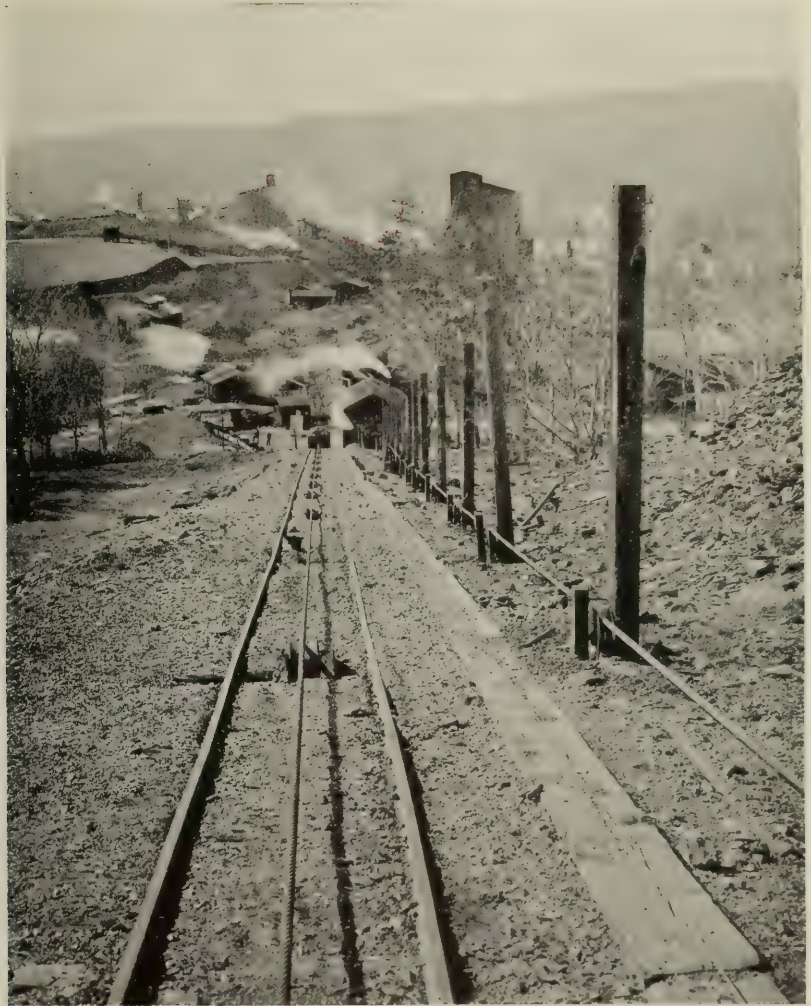
Westinghouse engineers will be glad to review any power problem with you and will offer the best recommendations that a wide experience can afford.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.
Sales Offices in All Principal American Cities

Westinghouse

ROEBLING WIRE ROPE

FOR MINE USE



Roebling Wire Rope is the product of 80 years' experience. It is made to fit the most exacting requirements of mine service. Our engineering staff is prepared to recommend a suitable rope for every condition of operation.

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY

NEW YORK BOSTON CHICAGO PHILADELPHIA PITTSBURGH
CLEVELAND ATLANTA SAN FRANCISCO LOS ANGELES SEATTLE PORTLAND, ORE.

See An Aerial Tramway in Operation at the Cleveland Convention

EVERYONE interested in the economical handling of mine products is cordially invited to visit our exhibition in Booth No. 146.

We will have on display wire ropes for all mining purposes; also an operating model of our Two-Bucket System of Aerial Tramway.

Our representatives will be glad to give you full information on our products, and to explain their points of superiority.

Established 1857

A. LESCHEN & SONS ROPE COMPANY

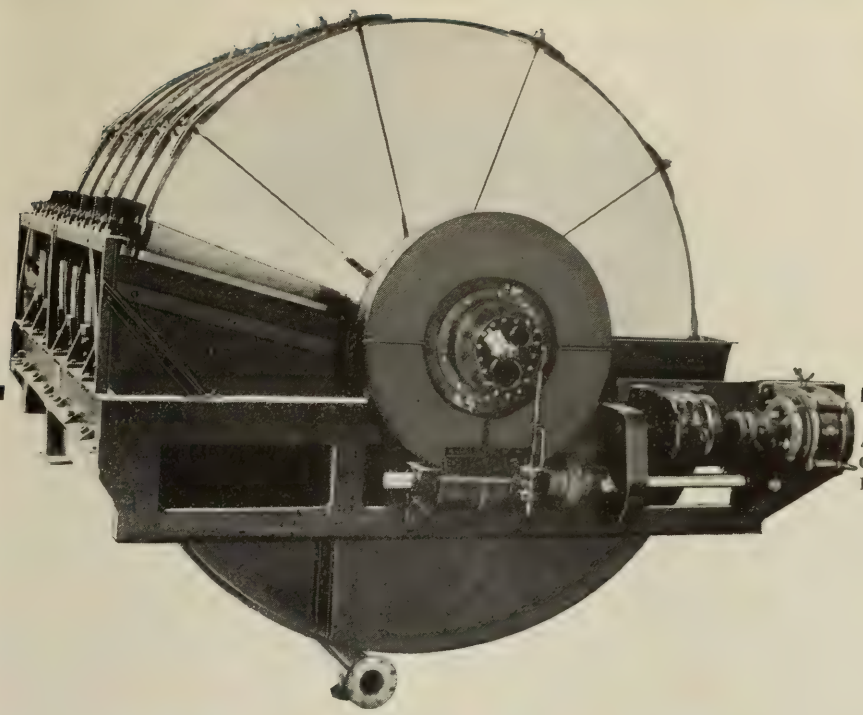
Manufacturers of

HERCULES(*Red-Strand*) WIRE ROPE

Patent Flattened Strand—Round Strand—Locked Wire Ropes, Aerial Wire Rope Tramways in Various Systems

ST. LOUIS, MO.

NEW YORK CHICAGO DENVER SAN FRANCISCO



AMERICAN CONTINUOUS FILTER

"Pay Dirt"

How does it pan?

The same question the Forty-niner used to ask of his gravel the metallurgical engineer and mill man of today asks of the machinery which works for him.

In these times of high wages and material costs a machine must be "Pay Dirt" indeed!

Recent umpire assays of the various filters used for dewatering metallurgical slimes, coal fines, coal washings and flotation concentrates show the American Continuous Filter to be the highest grade because—it handles 2½ to 3 times the tonnage per unit of floor space occupied—during their entire life the filter cloths give high capacity and do not clog—moistures are reduced to a minimum—special filter pan construction eliminates settling without resorting to expensive mechanical agitation—cloths can be quickly changed without long costly shut downs—heavy cast iron center shaft and disc design minimize corrosion.

In a word, the American Continuous Filter is a simple get-at-able, ruggedly built machine designed to stand up under severest mill conditions and installations all over the country are proving its superiority.

We hope to have the pleasure of seeing you at our exhibit, Booth 259, during the National Exposition of Mines and Mining Equipment. Our engineers at this exhibit or any of our branches will be glad to give you specific information as to the service which the United Filters Corporation stands ready to render you.

United Filters Corporation

Main Office and Works: Hazelton, Pa.

Sales Branches: New York, Salt Lake City, Chicago, Los Angeles

Export Office
Cunard Bldg.
25 Broadway, New York

Inquiries should be addressed to nearest office

UNITED
AMERICAN
SWEETLAND
KELLY
FILTERS

American Continuous Filters
Sweetland Pressure Filters

Kelly Pressure Filters
United Filter Presses
Sweetland Patent Metallic Filter Cloth

HAZARD Wire Rope

Keeping Step

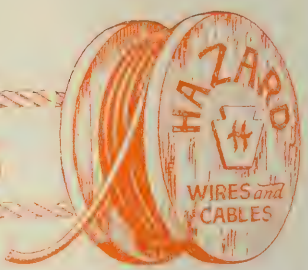
For more than a century Hazard products have been keeping step with progress. Beginning with iron wire in 1812, hand-made wire rope in the early Forties, and machine-made wire rope a few years later, Hazard has maintained a position of leadership in the industry.

Hazard electrical wires and cables for 25 years have exemplified the Hazard Quality standard.

See our display in Booth No. 110 in Cleveland Public Hall for the newest developments in Wire Rope and Electrical Cables for mining work.

HAZARD MANUFACTURING COMPANY
WILKES-BARRE, PA.
New York Pittsburgh Chicago Denver Birmingham

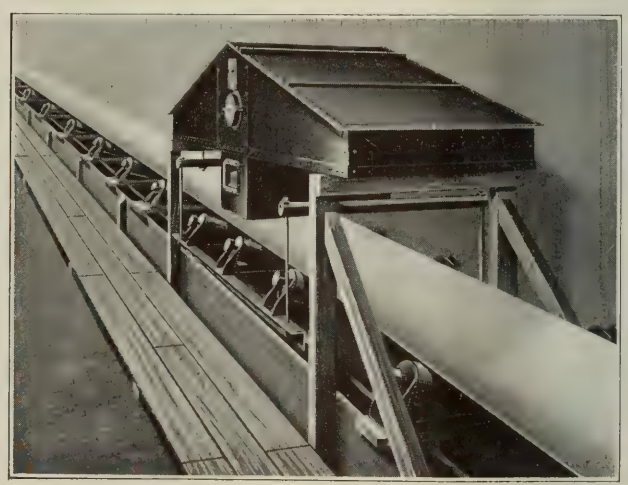
HAZARD RUBBER INSULATED Wires & Cables



The Merrick Conveyor Weightometer

Weighs Material While in Motion

Any material handled on a conveyor fitted with MERRICK WEIGHTOMETER is automatically weighed as it moves along. The scale is always on the job—it makes no slip-ups—it's honest—and its totals at the end of the day are accurate. MERRICK WEIGHTOMETERS require no special attendant. Any user of a conveyor whether belt or pan—large or small—can improve its efficiency by their use.



TYPICAL INSTALLATION "G" TYPE
MERRICK WEIGHTOMETER

TYPICAL INSTALLATION TYPE
"E" MERRICK WEIGHTOMETER

Hundreds of users in Ore and Coal Fields
NEEDS NO ATTENDANT OR WEIGHMAN
GUARANTEED AND PROVEN 99% ACCURATE
See a Weightometer in actual operation
Spaces 153, 154, 155
AMERICAN MINING CONGRESS, CLEVELAND, OHIO
October 9th to 14th

Merrick Scale Manufacturing Co.

Passaic, N. J.

You Hold
the
Winning Hand
if you are users
of
the

"Perfect"

Double Crimped Wire Cloth and REK-TANG Screens

Made by The Ludlow-Saylor Wire Co.
at St. Louis. Missouri. U.S.A.

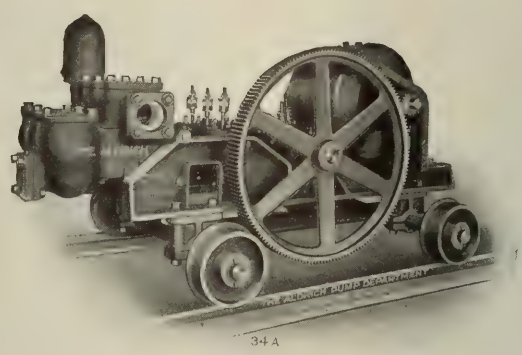
Aldrich Pumps

FOR MINE PUMPING

The Aldrich Horizontal Triplex illustrated herewith is one of our most popular pumps. Bronze fitted, as it is, and with cement lined water-end, also equipped with our patented Porcelain Plungers, it will handle acidulous mine water without trouble.

A pump of this type is included in our exhibit at the American Mining Congress Exhibition.

Ask one of our Engineers at Booth 12 to tell you about the Porcelain Plungers and other exclusive Aldrich features.



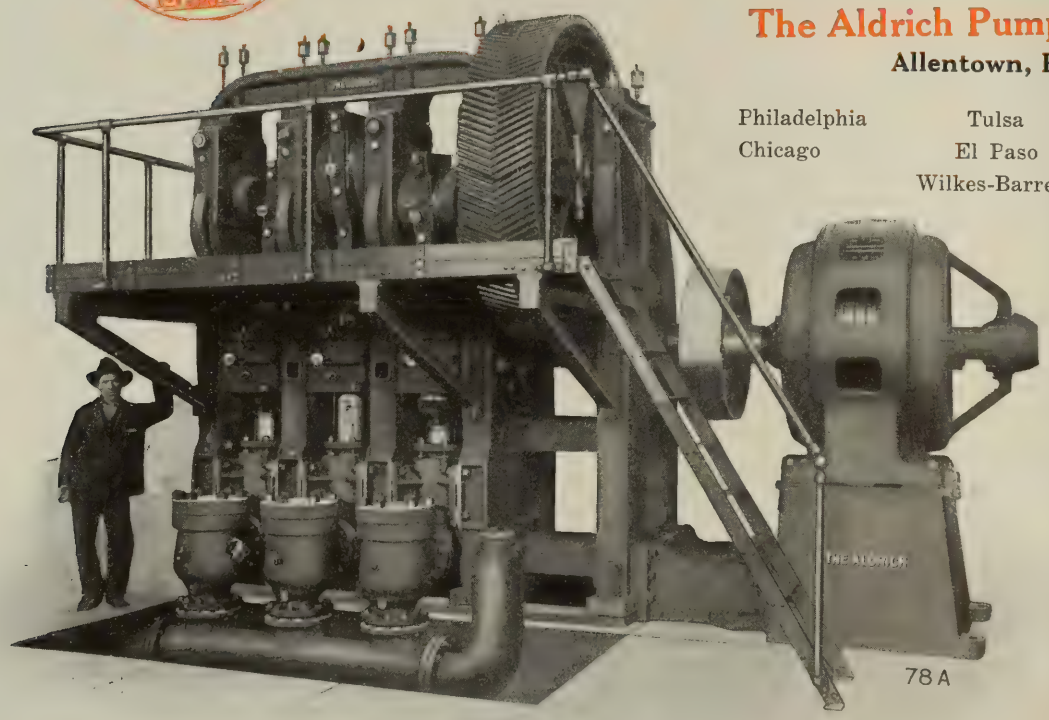
The ALDRICH LINE includes pumps for all conditions of Mine Pumping Service. Sinking Pumps, Gathering Pumps, Main Station Pumps.

The popularity of ALDRICH PUMPS amongst Mining Engineers is convincive evidence of their worth.

Write for our descriptive bulletins.

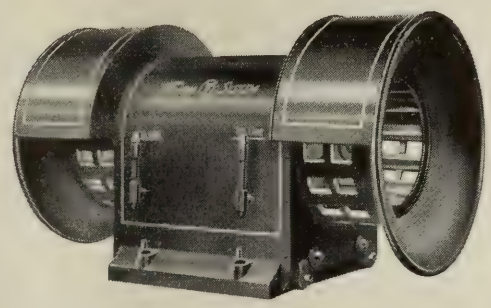
The Aldrich Pump Company
Allentown, Pa.

Philadelphia	Tulsa	Pittsburgh
Chicago	El Paso	New York
	Wilkes-Barre	



FEDERAL

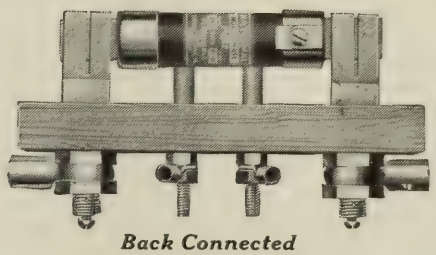
MINING PRODUCTS



That weird penetrating screech of the Federal Electric Siren-Whistle is loud and distinctive. It is far superior to the monotonous tone of a whistle and has replaced hundreds of them. Your men always hear it—it is never mistaken for any other signal. It gets them "on their toes" in a jiffy.

The Federal Electric Siren-Whistle is quicker to reach and easier to operate than any other signal. Its maintenance cost is only $2.00 a year. Push button control may be located at any point in office or mine.

The largest and best managed mining companies in the United States use the Federal Siren-Whistle. Made in several sizes and in models so that the proper one can be selected for any requirement. Get a Federal Siren-Whistle—the better signal for less money. Write today for full information and prices.



Back Connected

Front Connected

Continuous production with maximum protection to your mine and smelter multiphases (polyphase) motors against single phasing, overloads, short circuits and grounded circuits, at minimum cost, with Federal-National Multiphase Time Limit Powder Packed Renewable Fuses.

Fits your N. E. code fuse plugs, panels and switchboards. Long time element—wider range than any other protective device. Write today for full information and prices.

Federal Electric Company

8700 SOUTH STATE STREET

CHICAGO

130 West 42nd Street
New York City

91 New Montgomery Street
San Francisco, Calif.

Branches in All Large Cities

ERICO 250 VOLT—200 AMPERE
ARC WELDING AND BONDING OUTFIT

For 18 Years

our trade mark

"ERICO"

has stood for a service, organized and operated solely for the most satisfactory solution of the rail bonding problems peculiar to electric transportation and haulage.

Our development and perfection of

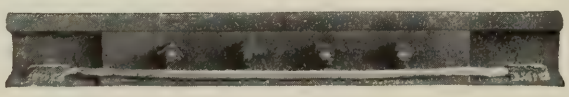
Arc Weld Bonds

and

Portable Arc Welding Outfits

has enabled electrified mines thru-out the country to secure an efficient track return of permanently low resistance, a maximum operating voltage, and a low power bill.

Get in touch with us



Type "A" Arc Weld Bond

The Electric Railway Improvement Co.

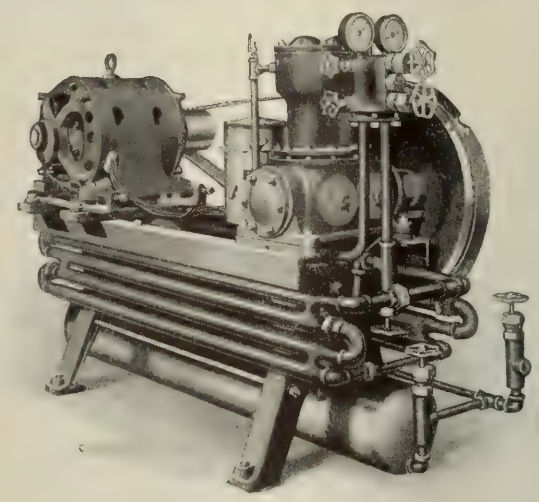
Cleveland, Ohio

The Last Word—

CLINTON

PORTABLE SELF-CONTAINED

REFRIGERATING EQUIPMENT



Manufactured by

Clinton Refrigerating Company

CLINTON, IOWA

Branch Sales Engineering Offices and Distributors in Principal Cities

BALANCED

"MARCUS"

COAL TIPPLES

It is Well to Secure Our Design Before Building

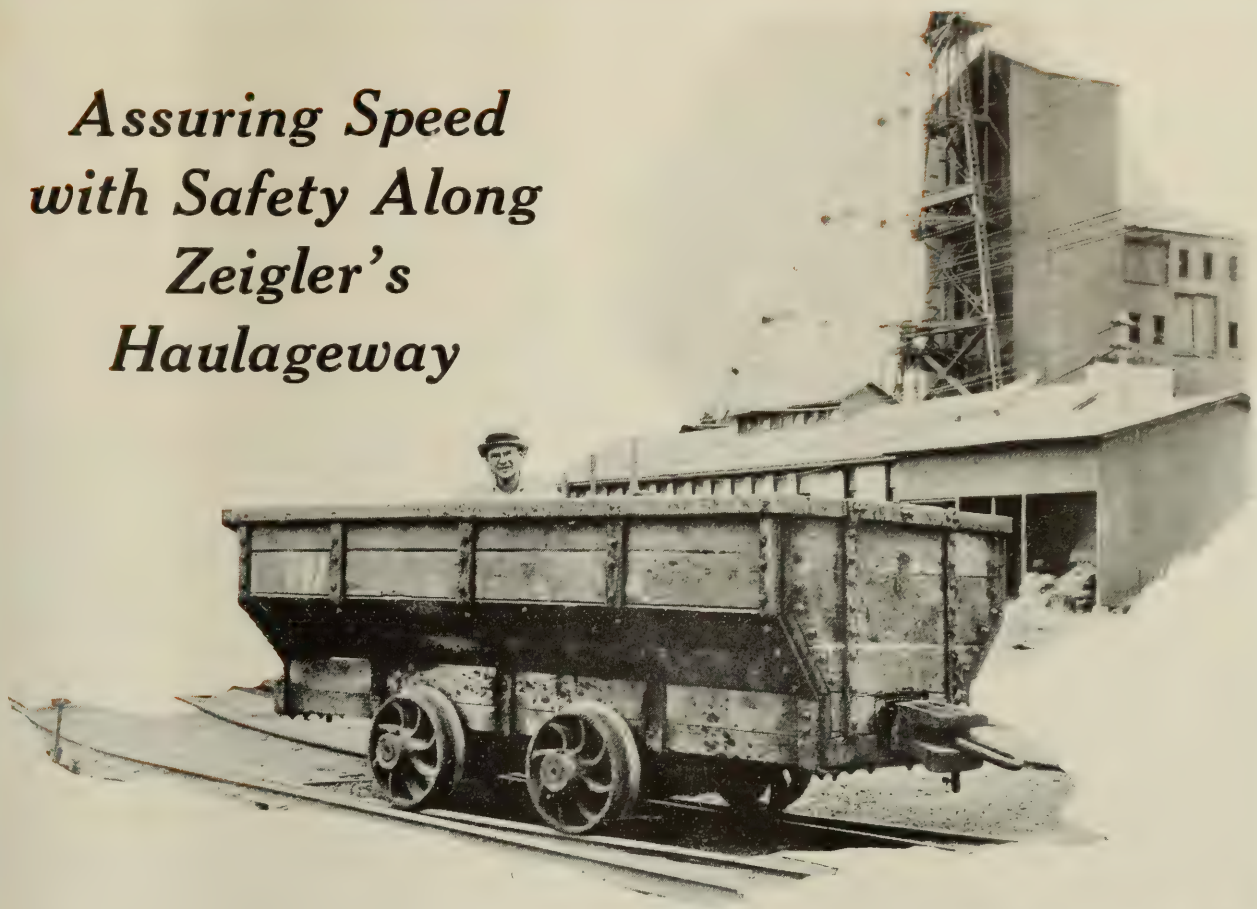
ANNOUNCEMENT

Exclusive Agents for the installation of equipment for dry cleaning of coal as manufactured by the American Coal Cleaning Corporation of Welch, W. Va.

ROBERTS AND SCHAEFER CO.

ENGINEERS AND CONTRACTORS - CHICAGO, U.S.A.

Assuring Speed with Safety Along Zeigler's Haulageway

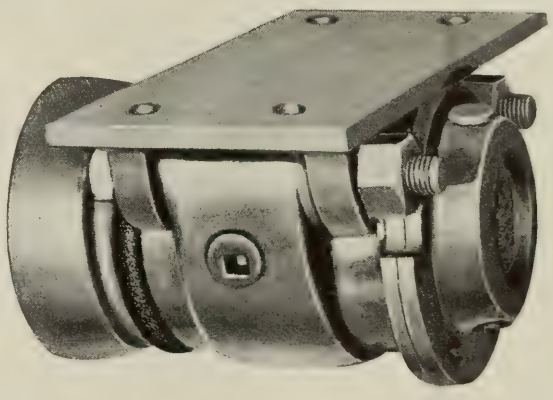


Zeigler's successful finish of the race—164,109 tons for the month—was due primarily to the dependable, easy-running carriers—mine cars equipped with Fleming-Hyatt Roller Bearing, Self-Aligning Journal Boxes.

Back and forth, from face to tipple, the cars pounded day in and day out. The jolts over uneven roadbed, the quick turns, stops and starts were well taken care of by the self-aligning, shock-absorbing feature of Fleming Journal Boxes.

Fleming Journal Boxes protect against wear, against dirt and prevent the loss of lubricant. The roller bearing feature reduces friction 50 percent, cuts power cost and speeds haulage.

J. R. FLEMING & SONS CO.
(INCORPORATED)
SCRANTON, PA.



If you are building new cars ask the car manufacturers to quote on cars equipped with Fleming-Hyatt Roller Bearing Journal Boxes. Can be applied to any type of car.

If you want new trucks ask us for quotations on complete trucks or Journal Boxes only and you assemble the trucks using similar wheels and axles obtained from your regular car manufacturer.

Ask for details concerning our money-saving re-equipping plan—use your old wheels and axles. NOW is the time to economically improve your haulage conditions.

Celebrated

LACKAWANNA ANTHRACITE

1823

1922

MAKES WARM FRIENDS

Produced By

THE HUDSON COAL COMPANY

Scranton = = = ***Pennsylvania***

The World's Largest Coal Breaker

THE LOREE BREAKER

A Working Model of the Loree Coal Breaker will be exhibited at the National Exposition of Mines and Mining Equipment, Cleveland, Ohio, October 9-14, by The Hudson Coal Company

THE HUDSON COAL COMPANY

Scranton = = = ***Pennsylvania***

D. F. WILLIAMS,
Vice-President and General Sales Agent

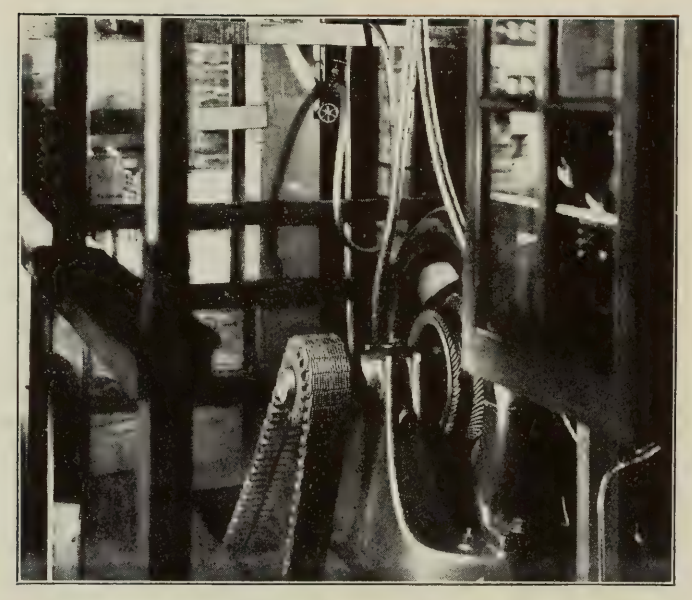
W. F. SHURTLEFF,
Assistant General Sales Agent

G. B. FILLMORE
Assistant General Sales Agent

MORSE SILENT CHAIN DRIVES

THE MORSE "ROCKER JOINT"

Eliminate Slippage



Showing Morse Silent Chain Driving Through Floor, in Dixon Crucible Plant

NO BOTHER OR TROUBLE

Using chain drives insures bigger production and more power at practically no expense in 15 years' operation.

COOL RUNNING
No Oil Bath Required

If this advertisement suggests a place, let Morse Engineers Co-operate to solve your drive problems.

M. McNAUGHTON, Consulting Engineer of the Joseph Dixon Crucible Company, Jersey City, says:

"Fifteen years ago we replaced our steam with electric power and it was at that time that we saw the immense value of chain drives—particularly in a location where a belt drive is subjected to the exposure of a substance which interferes materially with the cling of leather belting. We chose the Morse Chain Drive as best suited for this purpose.

"Today the same Morse chain purchased fifteen years ago is doing over 8½ hours' work daily and running at the rate of 1,500 feet per minute and developing 20 horse power, driving a machine on the next floor below, and in all these years the maintenance and repair costs have been negligible in spite of the terrific rate of speed it is operated.

"By using a Morse Silent Chain Drive we have totally eliminated slippage—so common with other drives, thus preventing the loss of power and production. Also with the Morse Chains, we drive direct—no line shaftings to take up space and cost additional money.

"During the entire time we have used Morse Silent Chain Drives we can conscientiously say that they have been no bother nor trouble in any way, and they are compact—nothing clumsy and inconvenient about these chain drives."

MORSE CHAIN CO. — **ITHACA, N. Y.**

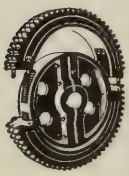
Morse Engineering Service

LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD

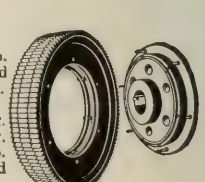
Assistance Without Obligation

Benefit by Morse Service as Others Do

Write for Booklet—Address Nearest Office



ATLANTA, GA.....Chandler Bldg., Earl F. Scott & Co.
BALTIMORE, MD.....1402 Lexington Bldg.
BOSTON, MASS.....141 Milk Street
CHARLOTTE, N. C.....404 Commercial Bank Bldg.
CHICAGO, ILL.....Merchants L. & T. Bldg.
CLEVELAND, OHIO.....Engineers Bldg.
DETROIT, MICH.....1361 Abbot St.
KANSAS CITY, MO...Finance Bldg., Morse Eng'rg Co.
NEW YORK CITY.....30 Church St.
MINNEAPOLIS, MINN...So. 3rd St., Strong-Scott Mfg. Co.
MONTREAL.....St. Nicholas Bldg., Jones & Glassco Reg'd
PHILADELPHIA, PA.....612 Franklin Trust Bldg. / 18-22 South 15th St.
PITTSBURGH, PA.....Westinghouse Bldg
SAN FRANCISCO, CAL.....Monadnock Bldg.
ST. LOUIS, MO.....Chemical Bldg., Morse Eng'rg Co.
TORONTO..Bank of Hamilton Bldg., Jones & Glassco Reg'd
WINNIPEG, MAN.....Dufferin St., Strong-Scott Mfg. Co.



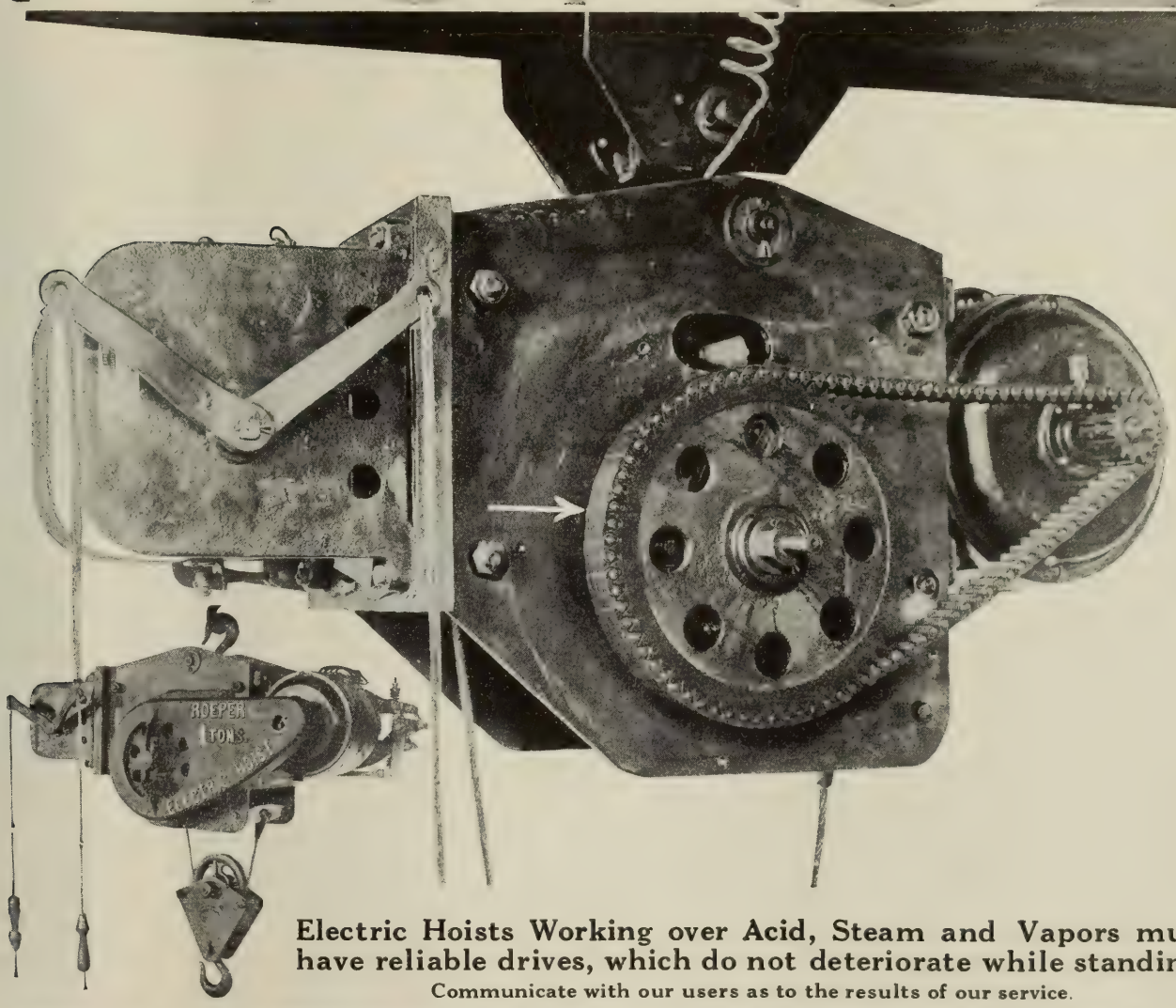
"MORSE" is the Guarantee Always Behind the Efficiency, Durability and Service.

MORSE

Quiet – Clean – Smooth Running

More Durable – Better Arrangement

Lower Upkeep



Electric Hoists Working over Acid, Steam and Vapors must have reliable drives, which do not deteriorate while standing.

Communicate with our users as to the results of our service.

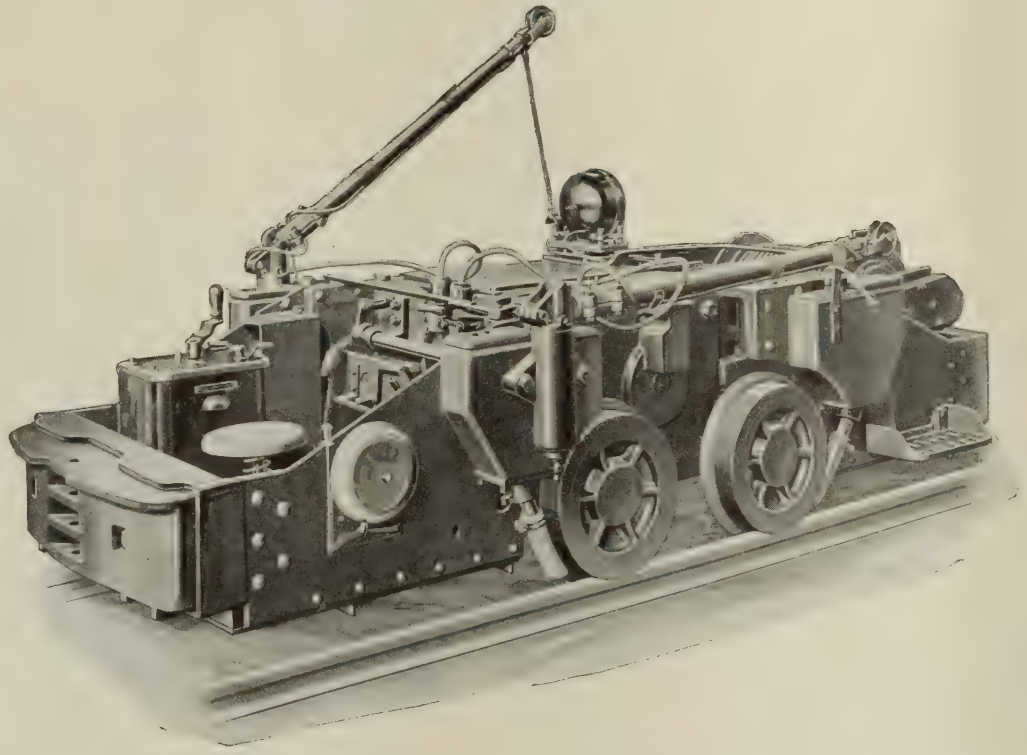
DRIVES

MORSE CHAIN CO. ITHACA, N.Y.

Address Nearest Office

ATLANTA, GA.,	702 Candler Bldg. Earl E. Scott & Co.	MINNEAPOLIS, MINN.	413 3rd. St., S. Strong-Scott Mfg. Co.
BALTIMORE, MD.	1402 Lexington Bldg.	CANADA,	Jones & Glasco, Regis'd.
BOSTON MASS.	141 Milk Street.	MONTREAL, St. Nicholas Bldg. Toronto,	Traders' Bank Bldg.
CHARLOTTE, N.C.	404 Commercial Bank Bldg.	NEW YORK CITY,	50 Church St.
CHICAGO, ILL.	Merchants L. & T. Bldg.	PHILADELPHIA, PA.	Fuller Bldg.
CLEVELAND, OHIO	Engineers Bldg.	PITTSBURGH, PA.	Westinghouse Bldg.
DETROIT, MICH.	Cor. 8th. and Abbott Sts.	SAN FRANCISCO, CAL.	Monadnock Bldg.
KANSAS CITY, MO.	Finance Bldg. Morse Engineering Co.	ST. LOUIS, MO.	Chemical Bldg. Morse Engineering Co.

"MORSE" is the Guarantee Always Behind the Efficiency, Durability and Service



FOR GATHERING—THE GOODMAN TYPE 30 LOCOMOTIVE

The Type 30 is not much larger than the average mine car, yet it gets into action quickly; has abundant power and is as rugged as a heavy haulage locomotive.

The Type 30 is built in three sizes—four, five and six tons.

It is amazingly alert in starting a load and just as quick to respond to the brakes—qualities accounted for by the large motor and the brake drum on the armature shaft.

What is more, the Type 30 steps out with a load you would hardly expect a larger and heavier locomotive to move. Its extra pulling power is due to the four-wheel unit drive from a single armature.

Of equal importance is its sturdiness for day-in-and-day-out working without constant attention and repair. This comes from Goodman quality in design and construction.

There is more about Type 30 in our new 64-page catalog. Other trolley types, as well as storage battery locomotives are described to help you in choosing your "gatherer." The catalog is valuable also for its general locomotive information. You get it by simply writing for "Book 220."

GOODMAN MANUFACTURING COMPANY

PITTSBURGH — NEW YORK — 48th to 49th Streets on Halsted — CHICAGO, ILL. — BIRMINGHAM — ST. LOUIS

CINCINNATI – CHARLESTON, W.VA. – SEATTLE – DENVER

(26)

DUPLICATE
REPORT OF MINE INSPECTION
I have this day Any day, inspected the Your Mine mine
Any County, and found that the total quantity of air at the inlet was
Abundant cubic ft. per minut was measured in each entry beyond the last
room turned, and in the c ms in each entry. The quantity of
air measured in each c
Split No.
Cubic Feet Air
Cubic Feet Air
Number Persons
THE BUCKEYE BLOWER COMPANY
COLUMBUS OHIO

A Clean Inspection Report Always for

BUCKEYE FANS

Buckeye Fans put the mine on a safety basis and increase the output per man owing to an abundant supply of fresh air. After firing, Buckeye enables the men to go back to their work quickly as it clears out the smoke with a very little waste of time. Put a Buckeye on the job and keep your mine free from danger of gases, and at the same time have the best possible working conditions for your men.

Buckeye Blower Co.

COLUMBUS, OHIO

DISTRICT AGENTS

Cleveland, Ohio
Cincinnati, Ohio
Toledo, Ohio
Terre Haute, Ind.
Clarksburg, W. Va.
Huntington, W. Va.
Morgantown, W. Va.
Pittsburgh, Pa.
Connellsville, Pa.
Hazard, Ky.
Knoxville, Tenn.

DIRECT FACTORY BRANCHES

188 North Clark Street, Chicago, Ill.
324 Monadnock Block, Chicago, Ill.
258 Candler Annex, Atlanta, Ga.
17 East Rich Street, Columbus, Ohio

BUCKEYE FANS WILL BE IN OPERATION AT

BOOTH 287

WHY TAKE ANY MORE CHANCES?

Williamsport Telfax Color Chart and a booklet on modern wire rope mailed on request.

WILLIAMSPORT
is a
QUALITY Wire Rope

For years the output of this mammoth plant has been absorbed by operators, whose requirements demanded uniformly high quality.

Increased facilities now make available to **all,** this quality wire rope. Millions of dollars have recently been spent on new additions, machinery and equipment, including a modern wire drawing plant. And today we are one of a few who draw all their own wire.

We invite and welcome all visitors to every part of this great plant. We want you to see how carefully we guard every step in the manufacture of Williamsport Wire Rope.

Here are two grades of wire rope; same size; same construction

They look so much alike that the maker himself cannot distinguish the difference. It requires a laboratory test. And, yet there are six cents difference per foot in the base price and *four tons difference in tensile strength.*

Countless mistakes have occurred since wire rope has been made —some willful—some perhaps fatal, in the marketing and use of wire rope under these conditions.

You don't need to buy wire rope this way anymore— WILLIAMSPORT protects your purchase

The core of every Williamsport Wire Rope now contains their new Telfax Patented Tape, definitely marking each grade of wire rope, thus removing forever the element of chance and necessity for guessing. Look for it.

It is the only wire rope made that provides this positive protection. So that now, **anyone** can distinguish at once the grade of wire rope he receives if he specifies Williamsport. This protection is of vital and far reaching importance to all wire rope users.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Pa.

"accepted as the best"

General Sales Office: Peoples Gas Bldg.
Chicago, Illinois

Air Drill Hose

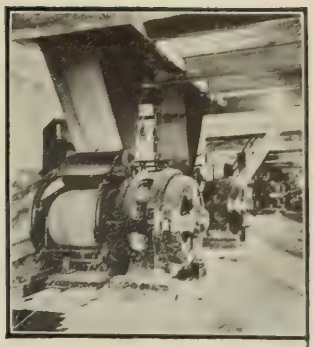
—"the most dependable hose we have ever been able to buy,"—a plant manager.

"Longlife" Conveyor Belt

One of these belts carried 7,313,400 tons of crude copper ore at a cost of less than .20 per thousand tons.

"New Mining" Elevator Belt

Introduced 4 years ago as the best wet fine elevator belt it has won its way to leadership in the far West by unusual demonstrations of durability.



"Commander" Trans. Belt

The ideal belt for crushers, rod and ball mills.

Let Goodrich shoulder the load!

MODERN mining practice puts the finished rubber product to a tremendously severe test. On the basis of determining the economy of a rubber product at the end of its service rather than on first cost, only the fittest can win their way to anything resembling preference or leadership. The mining industry year after year has taken a lion's share of the enormous output of the great Goodrich Mechanical Rubber division. Let Goodrich Rubber shoulder the loads where the service calls for rubber, and economies will be yours.

THE B. F. GOODRICH RUBBER COMPANY

Akron, Ohio

Visit us at the Convention, Booth No. 109

Goodrich

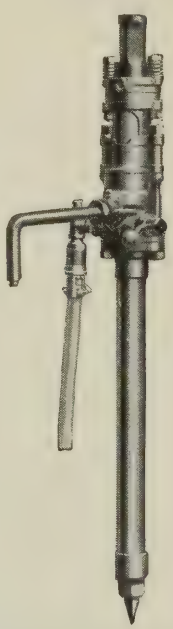
RUBBER GOODS

for the Mining Industry

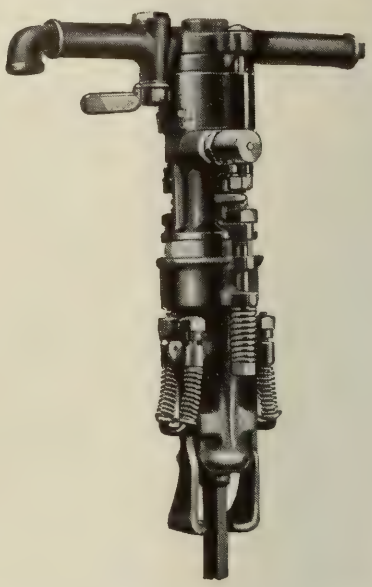
BE SURE AND CALL ON US

AT BOOTH NO. 122, MAIN FLOOR
PUBLIC HALL, CLEVELAND, OHIO

American Mining Congress *October 9-14, 1922*



We extend a hearty invitation to all visitors to the American Mining Congress to be held October 9-14 at Cleveland, to visit our booth on the Main Floor, next to the Auditorium Stage. Also, as we are located in Cleveland, we urge you to let us know if we can serve you in any way, either before you come or after you get here.



The Cleveland Rock Drill Company

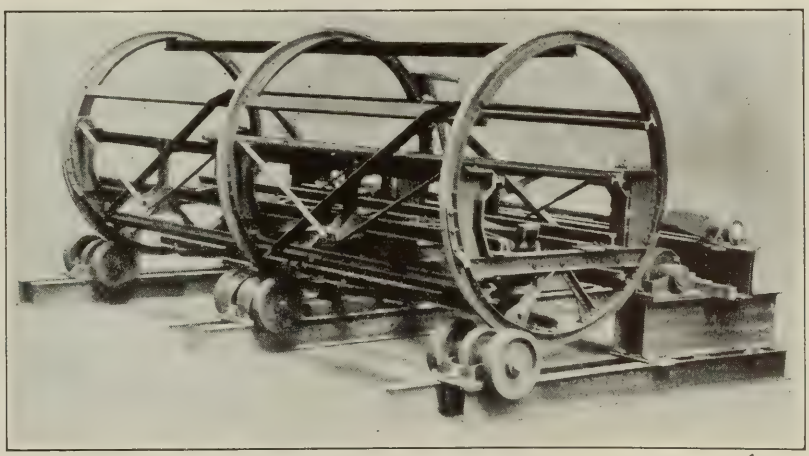
3734 E. 78th St.
CLEVELAND, OHIO
BELL TELEPHONE—BROADWAY 2040

Rotators *Drifters* *Stopers* *Augers*

The W-S-M Rollsright Gravity Car Tipple

See it in operation at the show

Let Gravity Do Your Work



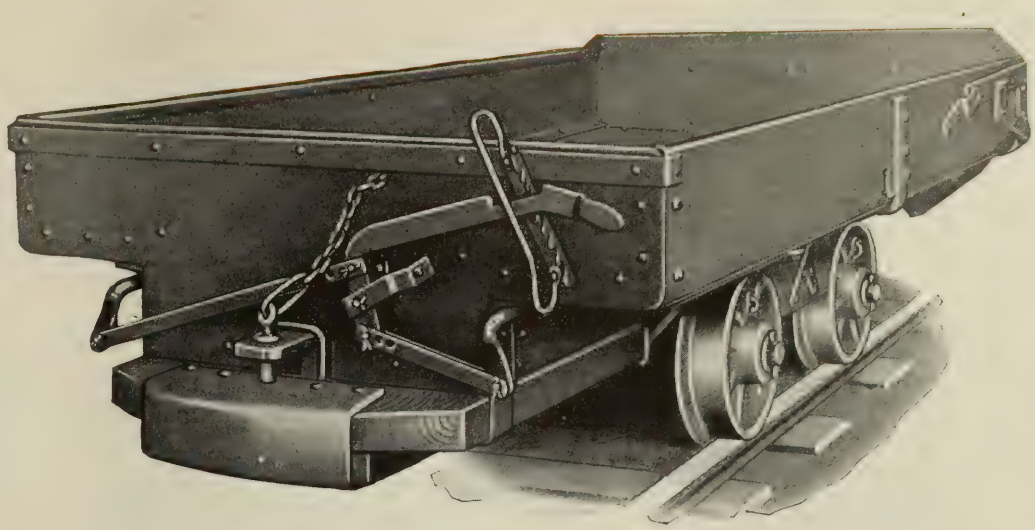
No Operating Cost Except Lubricant

THIS is a sturdily designed machine consisting of simple sections, principally tee rails and angle bracing, which operates solely by gravity. No outside source of power is required. No skilled labor needed. Cost of operation is confined to the lubricant only. The principle of operation is extremely simple. The center of gravity in the tube is offset from the center of rotation. This overturns and dumps one or more cars by gravity. Fly wheels store energy and bring the tube back to original position, ready to receive more cars. It will handle any coarse or fine material wet or dry. Installations in successful operation for three years.

Send for Bulletin No. 68

The Wellman-Seaver-Morgan Company, Cleveland, Ohio, U.S.A.

Hockensmith Makes *YOUR* Car—



Forty years of mine car manufacturing have taught us how to make any car for any mine, to the operator's specifications, in any quantity—

—and—

Every car JUST RIGHT

Hockensmith cars equipped with the famous Hockensmith Eureka Wheels.

Everything for the mine

HOCKENSMITH WHEEL & MINE CAR CO.

Penn, Pa.

(PITTSBURGH DISTRICT)

THE feature attraction at the Exposition will be at our Booth No. 134, where we will show some of our machinery in operation.

PLEASE CALL AND REGISTER

Robt. Holmes & Bros. Inc.

DANVILLE, ILLINOIS

"Builders of Coal Mine Machinery"

WIRE

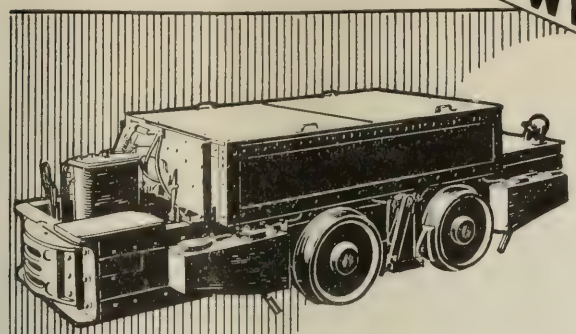
electrical, rope, airplane, piano, pipe-organ, flat wire (strip steel) hoops, bale-ties, tacks, nails, barbed wire, concrete reinforcement, springs, netting, wire fences, steel posts, steel gates, trolley wire and rail bonds, wire wheels, auto-towing cables, horse shoes, round and odd-shape wires, for manufacturing, screw stock.

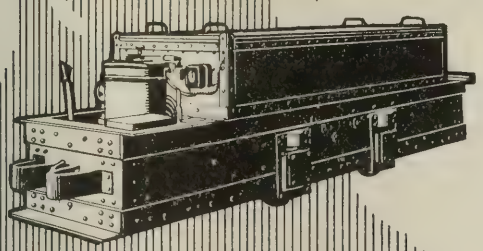
Illustrated books describing uses, free

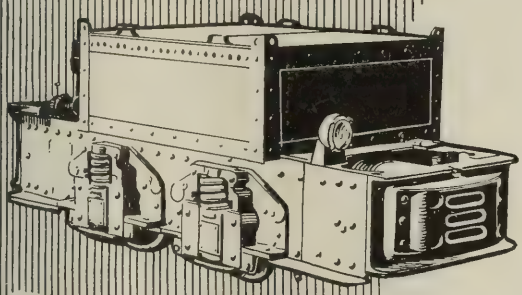
American Steel & Wire Co.

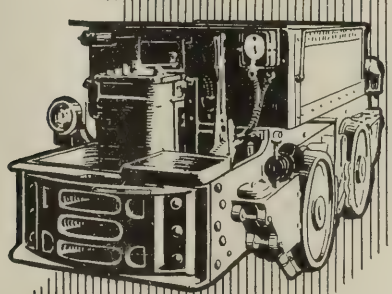
CHICAGO NEW YORK

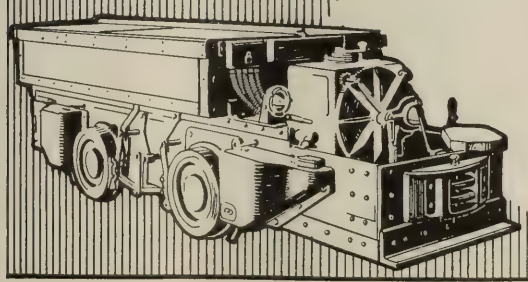
WHITCOMB LOCOMOTIVES











A Type and Size *for* every service

TROLLEY
With or without reel and cable

GASOLINE
Mining or Cab Type

PERMISSIBLE
COMBINATION—STORAGE BATTERY

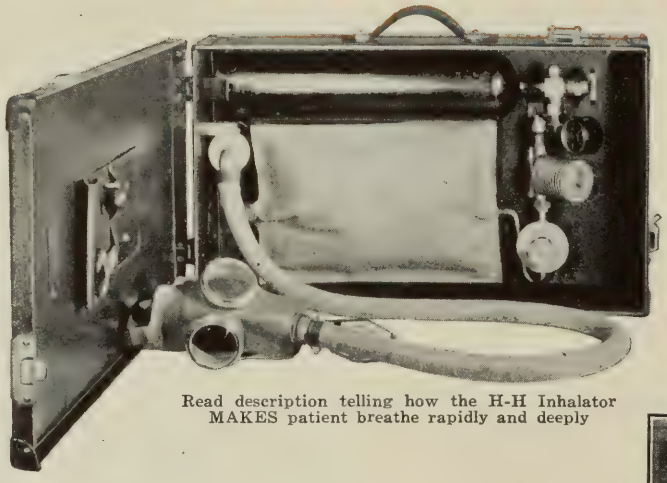
Recognizing the rapid progress being made in Mining methods, it has always been the aim of this company to keep in close touch with everyday requirements, and visualize the need of the future. That is why Whitcomb Locomotives are so strongly endorsed by their users.

Full details of any type will gladly be mailed on request.

George D. Whitcomb Company
Rochelle, Ill. U.S.A.

Representatives in all the principal Mining Centers

THE H-H INHALATOR



Read description telling how the H-H Inhalator MAKES patient breathe rapidly and deeply

A New Principle

The patient breathes a mixture of Oxygen plus Carbon Dioxide, either naturally or induced by the Schaefer Method of Artificial Respiration. Immediately the involuntary muscles respond, breathing becomes deep and regular. A maximum exchange is produced, Oxygen is absorbed, dangerous gases expelled, recovery is rapid, effects minimized.

Try it yourself at the Mine Safety Booth

BOOTH NO. 4

MINE SAFETY APPLIANCES COMPANY

Chamber of Commerce Building, Pittsburgh, Pa.

DRAVO

COMPLETE MINING PLANTS, SHAFTS, SLOPES AND TUNNELS, STEEL TIPPLES

PNEUMATIC CAISSONS and SUBMARINE CONSTRUCTION

LOCKS and DAMS, SEA WALLS, BRIDGE PIERS

INLAND WATERWAY, FLOATING and TERMINAL EQUIPMENT

ALL STEEL COAL BARGE and STEAMBOAT CONSTRUCTION

The Dravo Contracting Co.

Diamond Bank Building, Pittsburgh, Pa.

ENGINEERS and CONTRACTORS

ALLIGATOR

Trade Mark Registered

U. S. and Foreign Countries

STEEL BELT LACING

For Transmission Belts

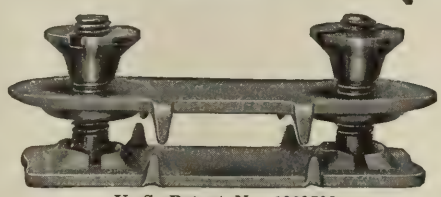
Alligator Steel Belt Lacing is the Strongest Belt Lacing on Earth—and the most permanent. It is applied with a hammer and joined with a rocker steel hinge pin making a flexible, separable joint, smooth on both sides. A size for every belt.

Sold through "Jobber Dealer" trade channels the world over.

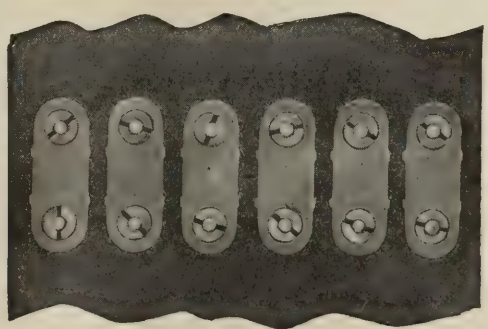
"Never lets go." Every tooth is a vise.

FLEXCO

TRADE MARK



U. S. Patent No. 1382799



TOP VIEW OF BELT

"High Duty" Conveyor Fasteners

For Conveyor Belts

When bolts are screwed down into the plates and bolt ends clipped off, this joint runs readily over return drums and idlers. Makes a tight butt joint of tremendous strength and durability. Outlasts any other known fasteners for tight butt conveyor service. Thousands of sets sold to mines and quarries after trial.

Let us send you literature and sample with our interesting "make good" offer for trial under your own service conditions.

FLEXIBLE STEEL LACING COMPANY

4668 Lexington Street, Chicago

In England at 135 Finsbury Pavement, London, E. C. 2.

Exhibiting In Cleveland, Mr. H. L. Coats In Charge

SKF

Ball Bearings on Mining Locomotive Motors Save 20% in Overall Length

WHERE tunnel width and track gauge restrict the overall dimensions of a motor of given capacity used in electric haulage units, the space sacrificed for long bearings makes it necessary to employ a higher flux density in the iron structure than when short bearings are used.

SKF marked self-aligning ball bearings, in saving 20 per cent of the over-all length required where plain bearings are used, permit the designing engineer to utilize this space for increasing the capacity of the motor or decreasing the iron losses which in themselves are frequently so great as to materially restrict the time of continuous running at full voltage.

Other advantages which play an important part in motor performances are, the elimination of frictional wear and the exclusion of coal dust and grit from the bearings. **SKF** marked self-aligning ball bearings prove in actual service the ideal bearings for accomplishing these results.

THE SKAYEF BALL BEARING COMPANY

Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

Normal View *Deflected View*

STONEHOUSE STANDARD STOCK SIGNS

TAGS AND BULLETIN BOARDS FOR ACCIDENT PREVENTION

SIZES OF STEEL SIGNS ILLUSTRATED

14″x20″—Nos. 799, 2102, 201, 205A, 203, 216, 214, 848.
9″x20″—Nos. 2202 and 694.
10″x24″—No. 001.
4″x24″—Nos. 960, 952, 946, 953, 915, 916.
10″x18″—No. 924.
10″x14″—Nos. 114, 198, 107, 118, 102, 103, 119, 1026, 1028, 1031, 1029, 1044, 1043, 1012A, 903A, 1305, 1322, 1401, 1315, 1313, 900A.
8″x15″—No. 011.
6½″x14″—Nos. 803, 833, 801, 807.
3½″x14″—Nos. 1603 and 1602.
7″x10″—Nos. 458, 441, 406, 431, 411, 409, 429, 407, 410, 17, 62, 1, 9, 977, 11, 5, 50, 32, 1138, 1103, 1144, 1145, 1100, 1148, 1141, 1059, 1054.
2″x10″—No. 913A.

LIFE SAVERS!

Creators of the Safety Atmosphere

which reduce your
Liability Insurance Costs

Silent Reminders!

Always on the job with real practical safety Sign Brains and system back of them

Not A-Hit-or-Miss

Jumble of words on a steel plate

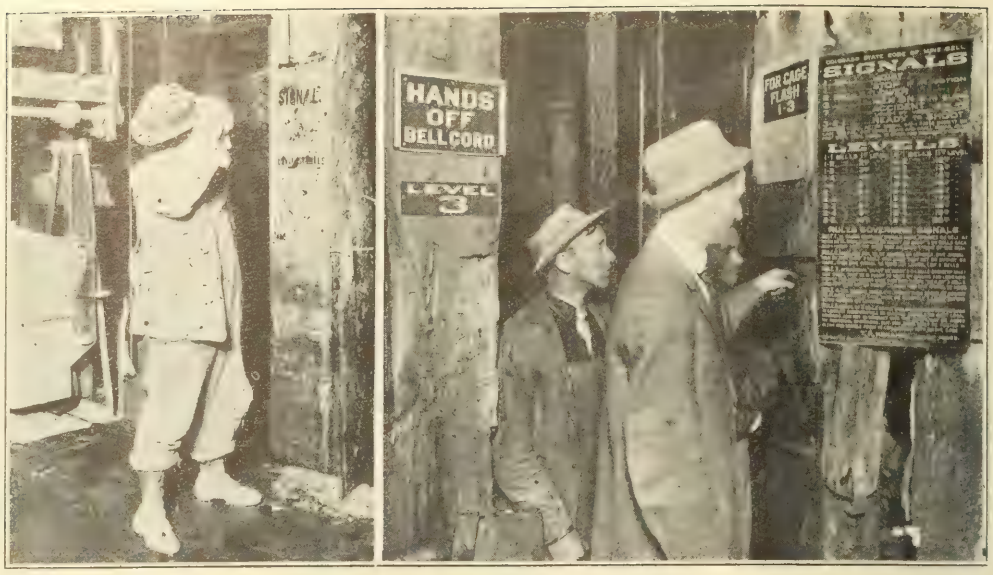
Made of 18 ga. Steel Porcelain Enameled or 30 ga. Steel Embossed Lithographed

A SELECTED ASSORTMENT FOR MINE USE
Our stock covers a thousand other kinds

DANGER MEN IN SHAFT 114
DANGER KEEP OFF INCLINE TRACK 198
DANGER DON'T STAND NEAR SHAFT 107
DANGER GAS 118
DANGER MAN WORKING IN CHUTE 102
DANGER KEEP OFF LOADED CARS & MOTORS 103
DANGER HIGH VOLTAGE 119
SAFETY FIRST BE CAREFUL SAFETY FIRST CARELESSNESS IS DANGEROUS 799
DISPENSARY 1603
UNIVERSAL SAFETY 2202
HOSPITAL STRETCHER HERE 924
INFORMATION 913 A
FIRST AID EQUIPMENT 1602
SAFETY FIRST 694
LOOK OUT THERE IS DANGER WHERE EVER YOU SEE THIS EMBLEM MEN WORKING ABOVE 2102
CAUTION KEEP AWAY FROM BOTTOM OF SLOPE WHILE TRIPS ARE BEING HOISTED 1026
CAUTION KEEP OFF THIS TIPPLE 1028
CAUTION DO NOT GO DOWN LADDERS — THE WRONG WAY — ALWAYS FACE LADDER AND HOLD ON WITH YOUR HANDS 1031
CAUTION KEEP OFF LOADED CARS AND MOTORS 1029
CAUTION KEEP OFF OF SLOPE IT IS AGAINST RULES AND A VIOLATION OF THE LAW 1044
CAUTION DO NOT COUPLE OR UNCOUPLE CARS WITH YOUR HANDS OR FEET WHILE CARS ARE IN MOTION 1043
CAUTION LOOK OUT FOR TRIPS 1012 A
SAFETY FIRST THEN CLEAN COAL 458
SAFETY FIRST YOU lose NAILS FOUND STICKING UP 441
SAFETY FIRST THINK! IF SAFE GO AHEAD 406
SAFETY FIRST REPORT ALL UNSAFE PLACES 431
SAFETY FIRST CARELESSNESS MAY COST A LIFE 411
SAFETY FIRST 409
SAFETY FIRST 429
SAFETY FIRST PENALTY FOR CARELESSNESS 407
SAFETY FIRST SAFETY SUGGESTIONS HERE 410
IT IS A VIOLATION OF THE LAW TO TALK TO ENGINEER WHILE HE IS — ON DUTY — 903A
NOTICE SAFETY BARS MUST BE KEPT ACROSS OPENING AT ALL TIMES EXCEPT WHEN ACTUALLY LOADING OR UNLOADING MATERIAL 1305
NOTICE IF YOU BRING OR USE LIQUOR HERE YOU WILL BE DISCHARGED 1322
THINK THE BEST SAFETY DEVICE IS A CAREFUL WORKER GET THE SAFETY HABIT 1401
NOTICE WHEN COMING OUT OF THE MINE WAIT UNTIL CAGE IS SET ON LANDING CHAIRS BEFORE STEPPING OFF OF THE CAGE 1315
NOTICE RIDING OF EMPTY OR LOADED TRUCKS UP OR DOWN ANY INCLINE ON THIS PROPERTY STRICTLY PROHIBITED 1313
A FIRE MIGHT PUT EVERY ONE OUT OF WORK HELP THE MANAGEMENT PROTECT YOUR JOB NO SMOKING 900A
DANGER DON'T TALK TO BRAKEMAN WHILE HOIST IS IN MOTION 17
DANGER KEEP YOUR HEAD OUT OF SHAFT 62
DANGER LIVE WIRE 1
DANGER DO NOT START ENGINE 9
FIRST AID KIT 977
DANGER KEEP OFF ENGINE CARS 11
DANGER MAN IN BOILER 5
DANGER MAN BELOW 50
DANGER LOOK OUT FOR FALLING ROCK 32
DANGER NO SMOKING, MATCHES OR OPEN LIGHTS. 201
DANGER EXPLOSIVES KEEP OFF 205A
DANGER EMPLOYEES FORBIDDEN TO TRAVEL SLOPE WHILE TRIP IS IN MOTION 203
DANGER THESE ARE PRIVATE PREMISES THERE IS MUCH DANGER IN MINING PROPERTY VISITORS ENTER AT THEIR OWN RISK 216
DANGER NOT ROOM ENOUGH HERE TO CLEAR MAN ON SIDE OF CAR 214
RELEASE CAGE SKIP OR BUCKET SIGNAL 1 1138
TO THE AIR SHAFT 803
TO THE ESCAPE SHAFT 833
848
THIS WAY OUT 801
MANWAY 807
011
THIS WAY OUT 1103
TO MAIN SHAFT 1144
TO AIR SHAFT 1145
HANDS OFF BELL CORD 1100
TROLLEY WIRE DANGER 1148
FOR CAGE FLASH 1-2
1141
001
SUPERINTENDENT 960
OFFICE 952
CAUTION THESE DOORS MUST BE KEPT CLOSED 1059
TO THE SURFACE 946
TIMEKEEPER'S OFFICE 953
CAUTION STAND STILL AND FACE THE GATE 1054
FIRE HOSE 915
NO SMOKING 916

SEND FOR CATALOG— COPYRIGHT, 1920, THE STONEHOUSE STEEL SIGN CO. —DENVER, COLORADO

HOISTING CODES and OTHER SIGNS for MINES

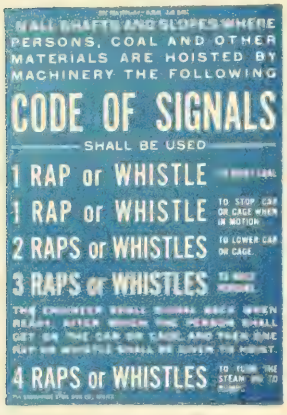


No two states use the same code of mine bell signals. Miners are a wandering class. No miner can remember every state code. The above man, from another state, his first shift, what is he to do? Take a chance on that bell cord, or wait for the shift boss? In any case the company pays for loss of time. Suppose he gives the wrong signal and there is an accident—the company is liable to the state for not having a legible code posted for the miner if he is injured, and for damage to the mine.

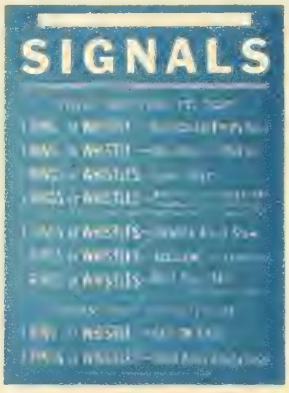
A code that is not at all times legible does not comply with any state law.

These Enameled Steel Signals and Signs for mines are made by fusing pure imported enamels on a sheet of steel under 1,600 degrees of heat, and are impervious to all underground mine conditions. They wear forever.

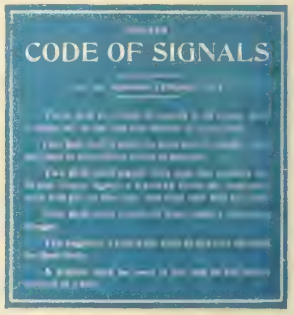
We carry numerous STATE MINE CODES in stock. We will make any State Code not in stock to order.


ALL SHAFTS AND SLOPES WHERE PERSONS, COAL AND OTHER MATERIALS ARE HOISTED BY MACHINERY THE FOLLOWING
CODE OF SIGNALS
SHALL BE USED
1 RAP or WHISTLE
1 RAP or WHISTLE
2 RAPS or WHISTLES
3 RAPS or WHISTLES
4 RAPS or WHISTLES

Penna. Code No. 1107



General Code No. 1135
Also Illinois Code No. 1106



Indiana Code No. 1109

Station and Level Signs above 3 in. x 9 in. Codes 14 in. x 20 in. Other Signs 7 in. x 10 in. Made of 18-gauge Steel Porcelain Enameled.

SAFETY FIRST

Stonehouse SIGNS, INC.

STONEHOUSE BLDG. 842 LARIMER ST. DENVER, COLO. U.S.A.

COMPANIES EXHIBITING

at

National Exposition of Mines and Mine Equipment

of the

American Mining Congress

Cleveland, Ohio, October 9-14, 1922

	Booth No.
Austin Machinery Corporation	246
American Blower Company	252
Atlas Car & Manufacturing Company	124-125
Austin Powder Company	149
Allis-Chalmers Manufacturing Company	143
Automatic Reclosing Circuit Breaker Company	140-156
American Steel & Wire Company	98
Aldrich Pump Company	12
American Mine Door Company	91-107
American Car & Foundry Company	256-257
C. O. Bartlett & Snow Company	141
Buckeye Blower Company	287
Bristol Recording Company	292
Bethlehem Steel Company	9
Black Diamond	28
Buckeye Welding & Supply Company	300
Brown Hoisting Machinery Company	99
Rock Bearing Company	One-half of 29
Conneaut Shovel Company	186
Cleveland Rock Drill Company	122
James H. Channon Manufacturing Company	37
Clinton Refrigerating Company	114
Coal Age	40
Carnegie Steel Company	82
Chrisman Foundry Company	237
E. I. du Pont de Nemours & Company	111
Duro Metal Products Company	So. half of 36
Dravo-Doyle Company	14
Deming Pump Company	274
Electric Railway Improvement Company	225
Elliott Electric Company	13
Electric Storage Battery Company	139
Easton Car & Construction Company	8
Edison Storage Battery Company	142
Fairmont Mining Machinery Company	244-245
Federal Electric Company	8
Flexible Steel Lacing Company	33
J. R. Fleming & Sons Company, Inc.	147
Fate-Root-Heath Company	224-240
Gurney Ball Bearing Company	89
General Motors Truck Company	279-280
Goodman Manufacturing Company	104
General Electric Company	293-294-295
B. F. Goodrich Rubber Company	109
Robert Holmes & Bros.	134
Hudson Coal Company	119-120-130-131-121-132
Hazard Manufacturing Company	110
Hyatt Roller Bearing Company	226-242
Hockensmith Wheel & Mine Car Company	138
Hercules Powder Company	105
Hill-Clutch Company	230
Hadfield-Penfield Company	152
Ironsides Company	253
Ironton Engine Company	158-159
Jeffrey Company	133
Joyce-Cridland Company	So. half of 35
Kenova Mine Car Company	241
Koehring Company	209-210
Keystone Lubricating Company	112
Keystone Construction Publishing Company	5
Kilbourne & Jacobs Company	(Not stated)
Ludlow-Saylor Wire Company	88
Lunkenheimer Company	27
Lorain Steel Company	80-81-96-97
A. Leschen & Sons Rope Company	146
Lake Superior Loader Company	263
Merrick Scale Manufacturing Company	153-154-155
Marchant Calculating Machine Company	19
Morse Chain Company	193
Morgan-Gardner Electric Company	10
Mine Safety Appliances Company	4
Myers-Whaley Company	219
Mancha Storage Battery Locomotive Company	126
R. D. Nuttall Company	(Not stated)
National Refining Company	39
National Coal Association	41
New York Belting & Packing Company	160
Ohio Brass Company	136-137
Oster Manufacturing Company	243
Oxweld Acetylene Company	202-203
Pittsburgh Machine Tool Company	258
Philadelphia Storage Battery Company	148
Post-Glover Electric Company	43
Press Steel Car Company	157
Pennsylvania Crusher Company	173
Rome Wire Company	150
John A. Roebling's Sons Company	106
Rock Products	No. half of 35
Roberts & Schaefer Company	218-235
Reading Steel Casting Company, Inc.	108
Simplex Wire & Cable Company	100
Standard Oil Company	86
Streeter-Amet Weighing & Recording Company	101-102
S. K. F. Industries	268-269
St. Louis Structural Steel Company	286
Southern Wheel Company	113
Safety Equipment Service Company	145
Stearns Conveyor Company	227
Sanford-Day Iron Works	220-221
Standard Welding Company	290
Standard Underground Cable Company	164
Standard Carbide Sales Company	So. half of 30
W. S. Tyler Company	116-127
Timken Roller Bearing Company	135-151
Templeton, Kenly & Company, Ltd.	32
United Filters Corporation	259
United Lead Company	162
Upson-Walton Company	239
Wood Shovel & Tool Company	185
Wellman-Seaver-Morgan Company	178-179
Weinman Pump Company	251
Westinghouse Electric & Manufacturing Co.	174-175-176
George D. Whitcomb Company	87-103
Watt Mining Car Wheel Company	228-229
Western Wheeled Scraper Company	254
Williamsport Wire Rope Company	115
U. S. Department of Agriculture	170-171
U. S. Bureau of Foreign & Domestic Commerce	15

THE BABY STEAM SHOVEL

"Hoar" Shovel with Saw Teeth for Soft Ores, Etc.

Every mine operator realizes what the steam shovel will do for him, in places where it is adaptable and many have gone to the trouble and expense to cut them down in order to get them into small spaces—all to take advantage of the steam shovel principles.

The "Hoar" is made as near like a steam shovel as possible and still make it small enough to work in the average underground mine, where room to work is the greatest factor to be considered.

"SUPPOSE THAT YOU HAD ROOM ENOUGH IN YOUR MINE TO OPERATE A STEAM SHOVEL. IT WOULD BE THE FIRST THING THAT YOU WOULD BUY." Apply the same idea with the room that you have. The "Hoar" will do any work that the steam shovel will do and some that it will not.

The "Rooting" motion of the "Hoar" cannot be duplicated by the steam shovel and actual results have proven that it will dig harder material than the steam shovel. We tried it out and proved it.

Among the nationally prominent users are:

Calumet & Hecla, Oglebay-Norton, Oliver Mining Company, Steel & Tube Co. of America, Hayes Mining Company, Cleveland-Cliffs, McKinley Steel Company, Ajax Mining Company, United Comstock Mines, City of San Francisco, California, Edison Company, etc.

"Send for the Details"

HOAR SHOVEL COMPANY, Inc.

214 Sellwood Bldg. DULUTH, MINNESOTA

The New Jersey Zinc Company

(Established 1848)

160 Front Street, New York

MANUFACTURER

ALBALITH	MOSSY ZINC	ZINC CHLORIDE
ZINC OXIDE	SLAB ZINC	MURIATIC ACID
OCHRE	ROLLED ZINC	SULPHURIC ACID
ZINC DUST	C. P. METALLIC ZINC	SALT CAKE
FEATHERED ZINC	SPIEGELEISEN	ZINC SULPHATE

New Jersey zinc

The World's Standard For Zinc Products

Miami Copper Company

61 Broadway
NEW YORK

ADOLPH LEWISOHN, President
J. PARKE CHANNING, Vice-President
SAM A. LEWISOHN, Treasurer
HERMAN COOK, Secretary

Mine at MIAMI, ARIZONA

F. W. MACLENNAN, General Manager

UNITED METALS SELLING COMPANY

25 Broadway, New York

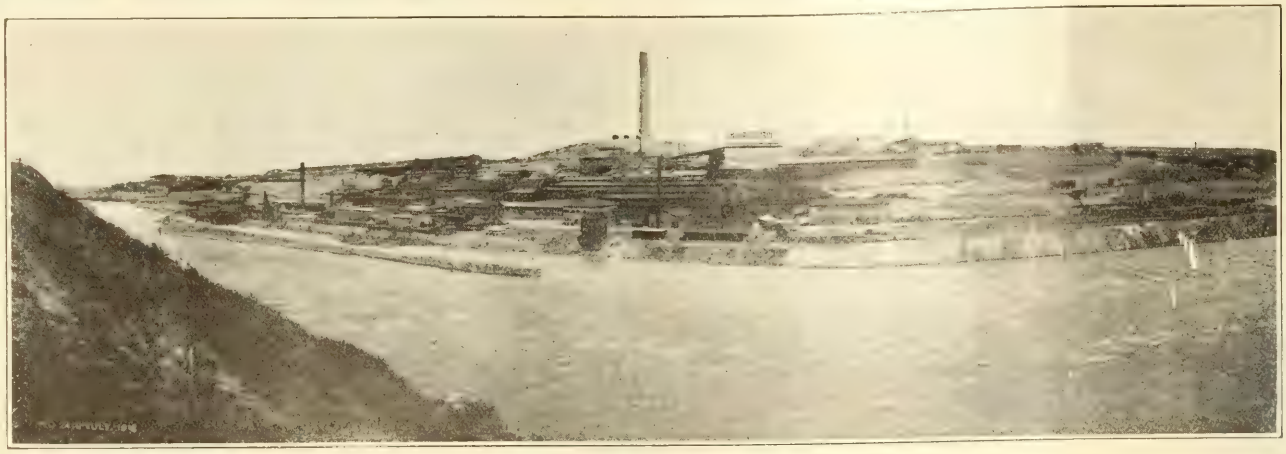
★

Electrolytic Copper
Best Selected Copper
Pig Lead--- Desilverised Common and Corroding
Electrolytic Zinc
Highest Grade and Purity

N E C & B M Brands
A B S & M A Brands
International (I. L. R. Co.)
Anaconda Electric

★

Selenium, Arsenic, Nickel Salts, Tellurium, Copper Sulphate



ANACONDA PLANT, GREAT FALLS, MONTANA

ANACONDA COPPER WIRE

TROLLEY, STRAND, TELEGRAPH, TELEPHONE, HOT ROLLED COPPER RODS

—FROM THE MINING OF THE ORE TO THE FINISHED PRODUCT—

ANACONDA COPPER MINING COMPANY

ROLLING MILLS DEPARTMENT

General Office: 111 W. WASHINGTON STREET, CHICAGO *Mills:* GREAT FALLS, MONTANA

American Zinc, Lead & Smelting Co.

Purchasers of

Zinc and Lead Ores

Address

1012 PIERCE BUILDING
ST. LOUIS, MO.

Exploration Department for the purchase of
Metal Mines and Metal Mining Companies

55 CONGRESS STREET BOSTON, MASS.

The American Metal Co., Ltd.

61 Broadway, New York

SELLERS OF:

ZINC

Prime Western and Brass

Copper	Zinc Oxide
Silver	Zinc Dust
Lead	Zinc Sulphate
Antimonial Lead	Sulphuric Acid
Tin	Tungsten
Gold	Ferro-Tungsten
Coal	Selenium
Arsenic	Nitre Cake
Metallic Arsenic	Molybdenum

BUYERS OF:

Gold, Silver, Lead, Zinc and Copper Ores

Copper Matte Copper Bullion

Lead Bullion

Tungsten Concentrates

Branches:

PITTSBURGH ST. LOUIS JOPLIN

Zenith ARCTIC Zinc

Zenith POLAR Zinc

ESTABLISHED 1839
CHEMICALS
ZINC
GRASSELLI
EXPLOSIVES
DYESTUFFS

We Are Buyers of

Zinc Ore
Zinc Concentrates

We Are Producers of

Slab Zinc
Zinc Dust
C. P. Sulphuric Acid
C. P. Hydrochloric Acid
C. P. Nitric Acid
C. P. Ammonia
Acids and Chemicals

THE GRASSELLI CHEMICAL COMPANY

CLEVELAND, OHIO
Guardian Bldg.

NEW YORK CITY
347 Madison Ave.

DETROIT, MICH.
ST. LOUIS, MO.
NEW ORLEANS, LA.

MILWAUKEE, WIS.
CINCINNATI, OHIO
PITTSBURGH, PA.

CHICAGO, ILL.
2101 Canalport Ave.

ST. PAUL, MINN.
BIRMINGHAM, ALA.

THE GRASSELLI POWDER COMPANY

NEW YORK CITY
117 Hudson St.

CLEVELAND, OHIO
Guardian Bldg.

CHICAGO, ILL.
Fisher Bldg.

High Explosives
Blasting Powder
Blasting Supplies

Rotary Air Compressors

For the mine, the factory and all other purposes. Are as advanced in Compressor design as the modern air drill is over the old single jack. Are as reliable as the power they are operated with. No troublesome parts to cause shut downs. They are light, small, easy to operate and easy to transport.

The Jackson Rotary Compressor is backed by eight years' experience in the Compressor business and by a factory investment of a half million dollars. They are positively guaranteed to satisfy.

Your inquiry will have prompt attention.

THE JACKSON COMPRESSOR CO.
235 So. Cherokee Street,
Denver, Colorado

PLYMOUTH CONSOLIDATED GOLD MINES, LTD.

MINES: *Plymouth, Amador County, California.*

GENERAL OFFICES: *614 Crocker Building San Francisco, California.*

GENERAL MANAGERS: *Bewick, Moreing & Co., 20 Copthall Avenue, London, E. C. 2. England.*

OFFICERS AND DIRECTORS

THE RT. HON. LORD COZENS-HARDY, K. C. ..... *Director*
C. A. MOREING ..... *Director*
W. A. MACLEOD ..... *Director*
J. C. GARDNER ..... *Director*
WILLIAM J. LORING ..... *Managing Director*
F. A. CREW ..... *Secretary*

"COLONIAL SERVICE

ATTAINS AND RETAINS THE GOAL OF THE MEN BEHIND IT"

Anything and Everything for the Mine

Individualizing each department, under the management of experienced mechanical engineers makes it possible for us to deliver to you the product best suited for your requirements.

Our Engineering Department offers you free advice on Power Saving Transmission Installations, Refractory Problems, Work Shop Equipments, Illumination and Equipment of Mines and Gas and Oil Engines.

Every item, among the hundreds we offer for sale, has been thoroughly tested and only the best taken from the world's markets.

Let us quote on your specifications.

COLONIAL SUPPLY COMPANY

MILL, MINE, MACHINISTS RAILWAY OIL AND GAS — ELECTRICAL AND CONTRACTORS SUPPLIES

217 WATER STREET, PITTSBURGH, PA.

TRADERS EXPORTERS IMPORTERS

NEW YORK PHILADELPHIA YOUNGSTOWN, OHIO WHEELING, W. VA.

New York Engineering Company

SPECIALISTS IN

Gold and Tin Placer Engineering and Equipment

"EMPIRE"
Gold and Tin Dredges

"EMPIRE"
Prospecting Drills

PLACER
Mining Equipment

SLUICES, RIFFLES, PIPE LINES, GIANTS

Our factory, located at tidewater at Yonkers, N. Y., is most favorably located for export shipments by water as well as for domestic shipments via New York Central lines, and is within easy access of the raw materials markets. Our manufacturing facilities, coupled with our experience in placer fields the world over, enables us to render a service that is a guarantee of satisfaction

WRITE FOR THE CATALOGS

Office 2 Rector St. New York

NEW YORK ENGINEERING COMPANY

Works Yonkers, N. Y.

CHAPARRAL HILL GOLD MINING COMPANY

(A MAINE CORPORATION)

MINES: *Carson Hill, Calaveras County, California.*

GENERAL OFFICES: *614 Crocker Building, San Francisco, California.*

OFFICERS AND DIRECTORS

WILLIAM J. LORING.....*President and Managing Director*
P. E. COYLE.....*Vice-President*
CHAS. H. SEGERSTROM.....*Director*
RUSSELL E. HAMLIN.....*Director*
J. REMICK.....*Director*
C. H. MEISTER.....*Secretary and Treasurer*

"IF THOMPSON MAKES IT IT'S MADE RIGHT"

The Thompson Manufacturing Co.

SUCCESSOR TO

The Weigele Pipe Works

WEIGELE PIPE - LASTITE ZINC FLUME - GALVANIZED STEEL FLUME
- IRRIGATION SUPPLIES -
HYDRAULIC ENGINEERS AND CONTRACTORS

TELEPHONE MAIN 1861

OFFICE AND WORKS
3001-3023 LARIMER STREET
3010-3022 WALNUT STREET

Denver, Colorado, June 14, 1922.

Mr. Bulkeley Wells, Managing Director,
The Metals Exploration Company,
Denver, Colorado.

Dear Mr. Wells:-

We wish to thank you for your several orders recently received for approximately twelve miles of Weigele Riveted Steel Pipe for your United Comstock Mines project at Gold Hill, Nevada.

This order is all the more appreciated because of the fact that you are one of our many customers who have used Weigele Pipe for years, and know from experience the meritorious service that users can always expect from Weigele Pipe working under the most difficult conditions.

Yours very truly,

LET:C THE THOMPSON MANUFACTURING COMPANY.
L. E. Thompson
President.

FRED W. WELLS, *President*
H. W. MOORE, *Vice-President*
P. L. RING, *Secy. & Treas*

The Western Belting & Packing Co.

1720-28 Wazee Street DENVER, COLO. Phone Champa 5545

Manufacturers of

Oak Tanned Leather Belting

Distributors of

Rubber Belting, Packing, Hose, Pulleys, Hangers, Etc.

Mill Installations a Specialty

CARSON HILL GOLD MINING COMPANY

(A MAINE CORPORATION)

MINES: *Melones and Carson Hill, Calaveras County, California.*

GENERAL OFFICES: *614 Crocker Building, San Francisco, California.*

OFFICERS AND DIRECTORS

W. J. LORING.....*President and Managing Director*
C. A. HIGHT.....*Vice-President*
F. W. BATCHELDER.....*Secretary and Treasurer*
FREDERICK AYER.....*Director*
BRADLEY W. PALMER.....*Director*
H. L. SMITH.....*Comptroller*

Old-Range, Mesabi, Cuyuna
Bessemer Non-Bessemer Low Phos. Manganiferous

Mesabi Sinter

Lake Superior Iron Ores

We mine our ores from our own mines on the Lake Superior ranges, and guarantee grade, tonnage and delivery to any point.

Clement K. Quinn & Co.

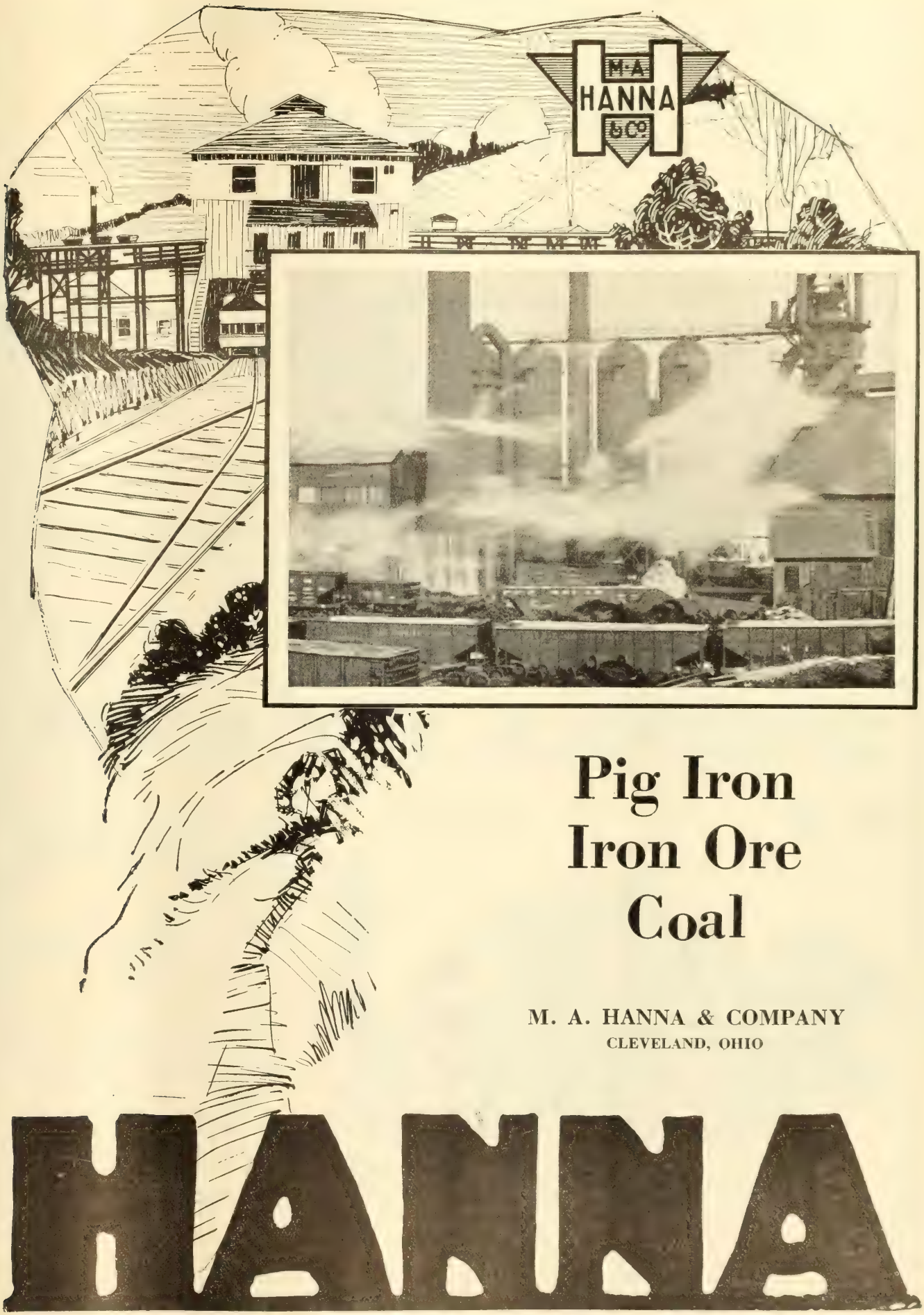
GENERAL OFFICES
Alworth Bldg., Duluth, Minn.

BRANCH SALES OFFICES
Kirby Bldg., Cleveland, O.

The Tod-Stambaugh Company

LAKE SUPERIOR IRON ORES

Cleveland, Ohio



Pig Iron
Iron Ore
Coal

M. A. HANNA & COMPANY
CLEVELAND, OHIO

HANNA

W. P. SNYDER & COMPANY

ESTABLISHED IN 1888

PITTSBURGH, PA.

CLEVELAND, O. DULUTH, MINN.

Miners and Shippers

Lake Superior Iron Ores

Manufacturers of

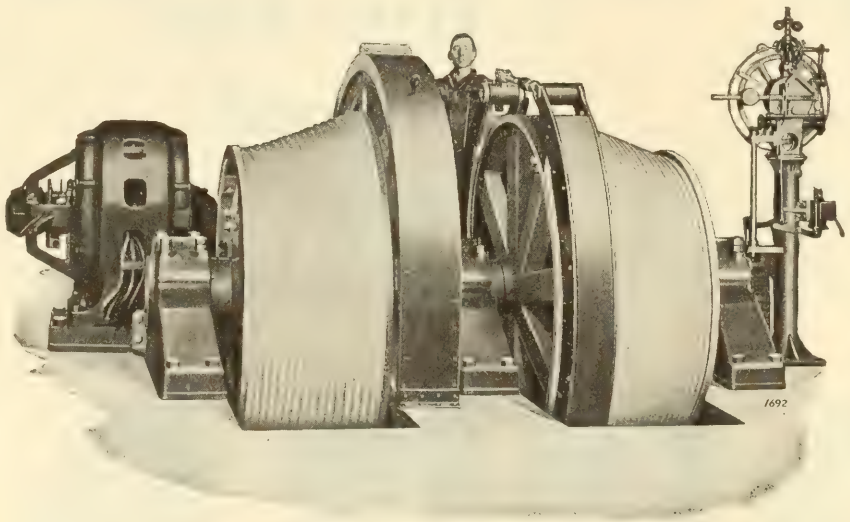
Pig Iron Coke Coal

THE SHENANGO FURNACE COMPANY

LIDGERWOOD MINE HOISTS

ELECTRIC
ANY SIZE

STEAM UP
TO 1000 H.P.



Conical Double Drum Shaft Hoist

BUILT TO MEET EVERY REQUIREMENT OF MINE SERVICE

Haulage conditions in mines vary greatly. We have developed many types of hoists to meet these varying conditions.

ECONOMY is one condition every mine hoist must meet.

The LIDGERWOOD HOISTS are designed in every part to give a smooth running well balanced hoist that will give the greatest rope pull with the minimum power, and have strength to prevent breakdowns.

THIS IS TRUE ECONOMY

Requests for Catalogs Invited

LIDGERWOOD MFG. CO., 96 Liberty Street, New York

Philadelphia Pittsburgh Chicago Detroit Seattle Los Angeles Cleveland Charleston, W.Va. London, England
Sao Paulo, Brazil Apartado 812. Mexico, D. F.

Oglebay Norton & Company

Sales Agents, Shippers

and Miners of

Old Range and Missabe

Bessemer, Non Bessemer and

Manganiferous

IRON ORES

General Office
Cleveland, Ohio

Lake Superior Offices
Ironwood, Michigan

Lake Transportation
The Columbia Steamship Company

Pickands Mather & Co.

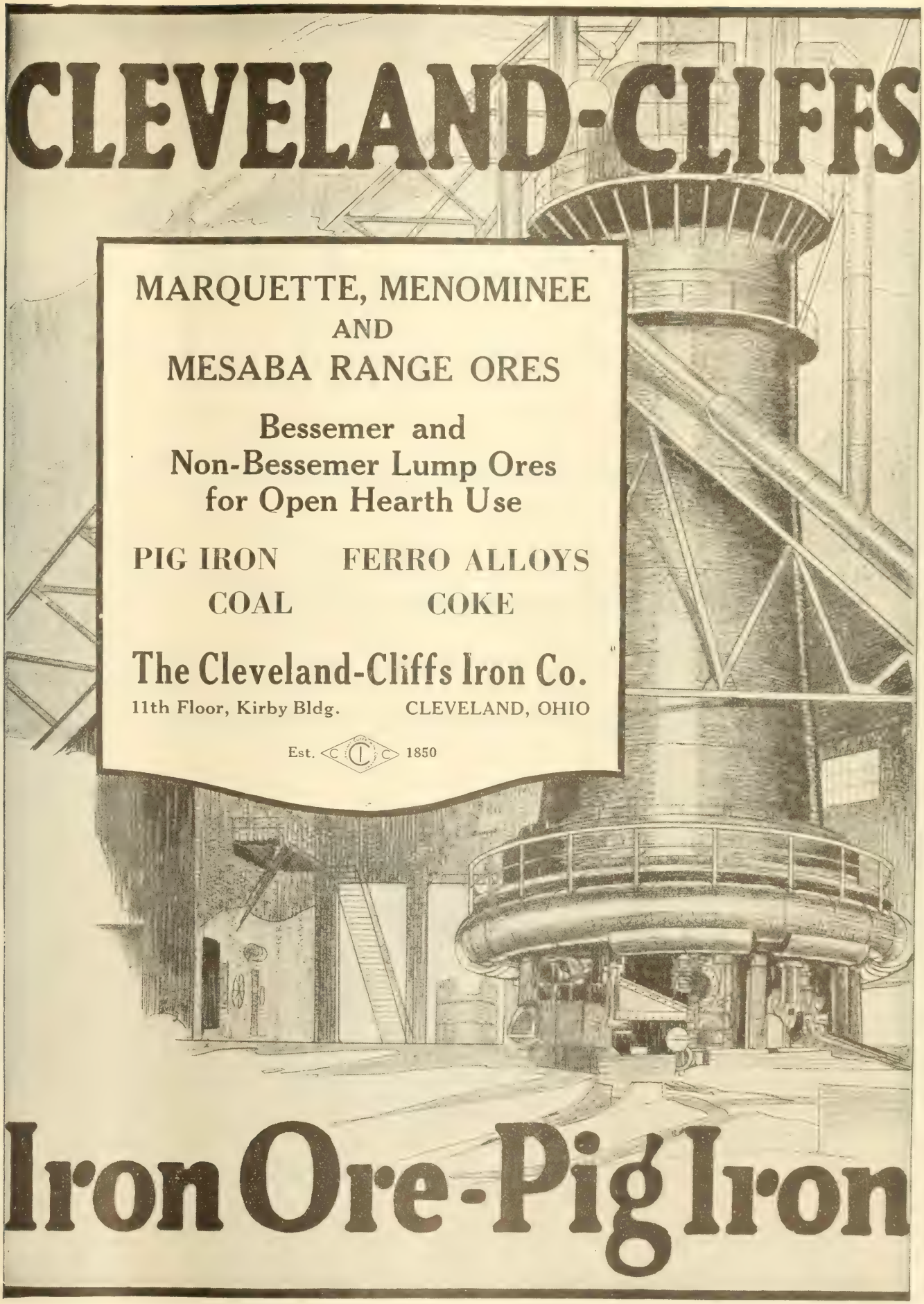
PRODUCERS AND SELLERS OF

IRON ORE
PIG IRON
COAL

Cleveland, Ohio

Duluth, Minnesota *Detroit, Michigan*

CLEVELAND-CLIFFS



MARQUETTE, MENOMINEE
AND
MESABA RANGE ORES

Bessemer and
Non-Bessemer Lump Ores
for Open Hearth Use

PIG IRON FERRO ALLOYS
COAL COKE

The Cleveland-Cliffs Iron Co.

11th Floor, Kirby Bldg. CLEVELAND, OHIO

Est. 1850

Iron Ore-Pig Iron

THE UNION SULPHUR COMPANY

PRODUCERS OF HIGH GRADE BRIMSTONE

GUARANTEED 99½ PERCENT PURE

FREE FROM ARSENIC SELENIUM OR TELLURIUM

WE MAINTAIN WAREHOUSES WITH GENEROUS SUPPLIES IN CONVENIENT CENTERS TO TAKE CARE OF EMERGENCIES

MAIN OFFICES

Frasch Bldg., 33 Rector Street
NEW YORK

MINES AT SULPHUR, LOUISIANA

Crude Sulphur

(99½% PURE, FREE FROM ARSENIC AND SELENIUM)

Mined from probably the

Largest Deposit in the World

Texas Gulf Sulphur Company

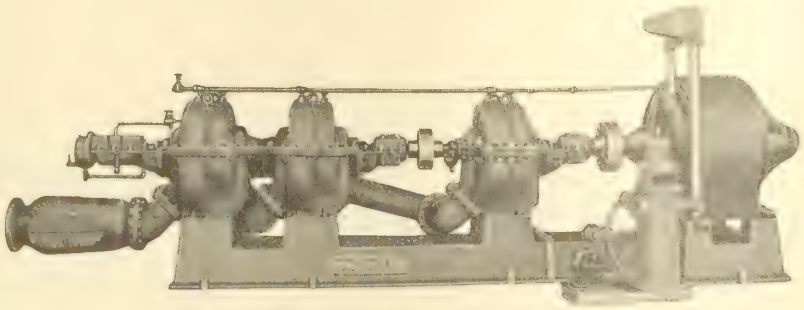
(INCORPORATED)

General Offices

41 East 42nd Street, New York

Sulphur Deposit and Plant

Gulf, Matagorda County, Texas



"HAZLETON" CENTRIFUGAL MINE PUMP

EQUIPPED WITH "HAZLETON" STRAINER, "HAZLETON" CHECK-VALVE AND

"HAZLETON" PRIMING PUMP

The Latest Advance in the Development of Modern Priming Equipment

BARRETT, HAENTJENS & COMPANY
HAZLETON, PA.

REMCO
PIPE-TANKS

Highest Grade For Mining and Metallurgical Plants.

Made from Air Dried Redwood.

Has an Unbroken record from 1880 to 1922.

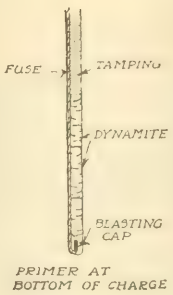
MADE SOLELY BY

Redwood Manufacturers Co.

11 So. LaSalle St. CHICAGO
Hobart Bldg. SAN FRANCISCO
308 East 3rd St. LOS ANGELES

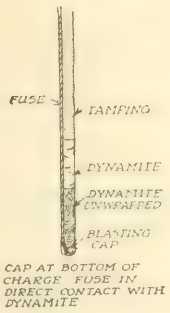
Dynamite Efficiency Depends upon Proper Priming

Load Dynamite the *Wrong* Way and You *Lose* Money



Here is one WRONG way:

For instance, the cap with fuse should not be placed at the bottom of the hole like this as the side spit of the fuse would be likely to set fire to the dynamite.

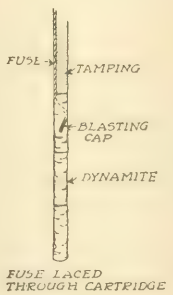


—here is another

This is also bad practice as the cap is pointed *away* from the charge instead of toward it and the fuse is also likely to set fire to the dynamite before the cap explodes.

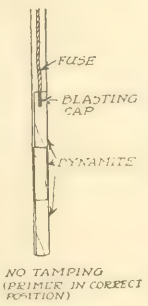
—and another

Even the middle of the charge is not the right place to put the primer as the top cartridge does not receive the full force of the cap and the fuse may ignite the powder that touches it.



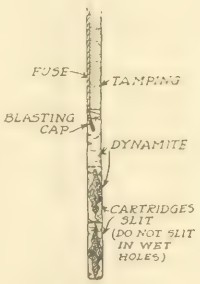
—still another

Lacing the fuse through the priming cartridge is bad practice. It nearly always lets the fuse side spit into the dynamite.



Another WRONG way:

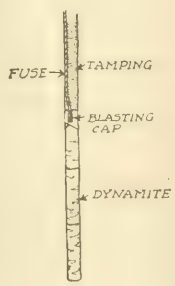
This kind of loading, without tamping, is expensive and inefficient as the top cartridge wastes most of its force blowing out the hole. The Bureau of Mines reports that tamping increases the effectiveness of high explosives enormously



—and another

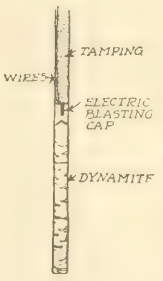
If the holes are full of water the cartridges of dynamite should not be slit as water affects nearly every kind of dynamite except gelatin.

Load Dynamite the *Right* Way and You *Save* Money



The RIGHT way:

This way, with the cap in the top of the *top* cartridge, pointing *down* toward the bulk of the charge, with lots of tamping and no part of the fuse touching the powder will give you a perfect shot every time.



Another RIGHT way:

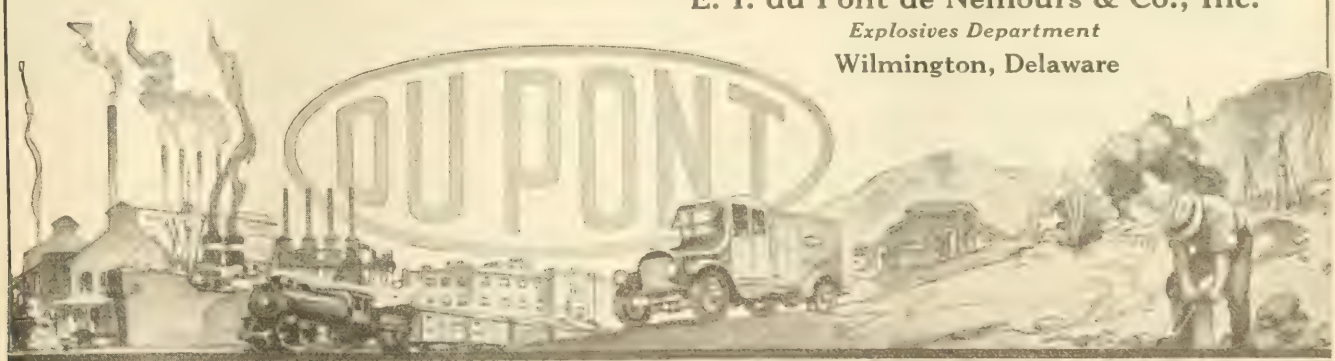
Or even if you fire electrically, you will get best results this way as the electric blasting cap is placed so as to exert its *maximum* detonating effect on *all* the explosive in the charge.

Branch Offices:

Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Huntington, W. Va.
Kansas City, Mo.
New York, N. Y.
Pittsburgh, Pa.
Portland, Ore.
St. Louis, Mo.
San Francisco, Calif.
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.
Springfield, Ill.

Du Pont Products Exhibit
Atlantic City, N. J.

E. I. du Pont de Nemours & Co., Inc.
Explosives Department
Wilmington, Delaware



EXPLOSIVES ~ SERVICE

Something Happens Every Day

AT THE NATIONAL CAPITAL

The coal, the iron, the lead —the whole mineral industry—may unexpectedly be subject to "investigation."

The Daily Information SERVICE of

THE AMERICAN MINING CONGRESS

Keeps mining men quickly, authentically, and thoroughly advised of happenings of mining interest in the National Capital, whether they be Congressional action, or inter-departmental activities.

Full information gladly sent on request. Address:
841 MUNSEY BUILDING, WASHINGTON, D. C.

Heyl & Patterson, Inc.

ESTABLISHED 1887

Main Office and Plants

PITTSBURGH, PA.

Branch Office: 90 West Street, NEW YORK, N. Y.

Contracting Engineers

Maintain Complete

Engineering Organization.
Structural and Machine Shops.
Field Forces.

Prepare Estimates, Plans and Specifications and Design, Fabricate and Erect the following

Products

Bradford Breakers.
Batch Mixing Plants.
Car Haulage Systems.
Coal and Ash Handling Apparatus.
Coal and Coke Crushers.
Coal and Coke Plants for By-Product Coke Ovens.
Coal and Ore Storage Bridges and Cranes.
Coal Washing Plants and Larry Bins.
Gas Producer Plants.
Lehr Conveyors.
Loading Booms.
Picking Tables.
Pig Iron Casting Machines.
Pulverized Coal Equipments.
Refuse Disposal Cars.
Rope Haulage Systems.
Screening Plants.
Shaking Screens.
Storage Plants.
Telphers.
Tipples and Equipment.
Transfer Cars.
Traveling Batch Mixers.
Unloading Towers.
Wharf and Cargo Cranes.

HEAD FRAME & TIPPLE FOR RAIL AND RIVER LOADING.

What More Could You Ask of a Shovel!

Here is one of the many examples of the exceptional service given by Wood's Mo-*lyb*-den-um Shovels.

Monterrey, N. L.
January 7th, 1922.

The Wood Shovel & Tool Company
Piqua, Ohio.
Gentlemen:—

For the past year we have been using several of your "Mo-*lyb*-den-um" square point shovels in our warehouse for unloading and handling sand, gravel, broken stone, steel borings and turnings, and for general excavation. We are pleased to report that to date these shovels do not show enough wear to give us a basis for computating their probable life.

These "Mo-*lyb*-den-um" shovels were used along with a very high quality carbon steel, and the carbon steel shovels have worn during a year to such an extent as to make them practically unfit for further service, while the "Mo-*lyb*-den-um" are as good as new and are the favorites of the workmen.

There is a wall in front of the store-house of very hard, dense concrete with blue limestone aggregate and we have about spoiled its appearance by chipping large pieces out of the top with the corners of the "Mo-*lyb*-den-um" shovels. We have allowed several of our local "strong men" to try to break or bend the shovels in this manner and have never been able to find even a mark on the shovel where it came in contact with the concrete. A very mild blow is sufficient to bend back the corner of the crucible steel shovel such as we have been using in the past.

We wish to state that in view of our satisfactory experience with your shovels which we have tested, we shall confine our purchases to "Mo-*lyb*-den-um" shovels.

With best wishes for your success, we are,

COMPANIA MINERA DE PENOLES, S. A.
Supply Department
By H. C. Sovereign, Pur. Agt.

Our shovel-testing machine will be on exhibition in Booth 185 at the National Exposition of Mines and Mining Equipment, Cleveland, Ohio, October 9-14.

THE WOOD SHOVEL AND TOOL CO., PIQUA, OHIO

Wood's Mo-lyb-den-um *The American Super Steel* **Shovels**

The
MINING CONGRESS JOURNAL

PUBLISHED EACH MONTH BY THE AMERICAN MINING CONGRESS, MUNSEY BLDG., WASHINGTON, D. C.
Subscription Rate, per Year, $3.00 Single Copies, $0.30

VOLUME 8 OCTOBER, 1922 NUMBER 10

ORGANIZED LABOR

IT MIGHT BE inferred from editorial statements in criticism of organized labor as it now functions that the MINING CONGRESS JOURNAL is opposed to the organization of labor. This inference is entirely without foundation. We believe that the organization of labor is not only advisable but necessary to the efficient coordination of productive energy. We believe that the best results in any field of endeavor will come about through the most complete cooperation between all of the various agencies of production. And further, that all of these various agencies of productive power, each by itself, must be in position to negotiate for its own advantage and to protect itself against improper encroachments of other agencies.

The only limit which should be placed upon such cooperative action is such as will prevent any one of these agencies from securing by force or intimidation so much of the general return for the service rendered as will either subtract from the just return of other agencies or place an undue burden upon the ultimate consumer. The consuming public is entitled to have its products furnished at the lowest price consistent with a fair wage to the labor involved in production, transportation and distribution, a fair profit to the capital invested and a proper compensation for the directing capacity which makes possible economic production by coordinating the earning power of capital and labor. The denial of this right to the consumer whether as the result of aggregated capital or combined labor is equally objectionable.

The Sherman Anti-Trust law was enacted for the express purpose of preventing the enhancement of price either by restriction of production or otherwise through which the consuming public was required to pay an excessive price. While the struggle of organized capital to escape the restrictions of the Sherman Anti-Trust law was in progress, many lines of business, in which ownership was widely scattered and where conditions of production were essentially different, were forced into a cut-throat competition for existence which was equally detrimental to business. During this period, labor organizations were strong advocates of restrictions upon combinations which made possible too great a control on the part of the employer. During that period, organized labor was a firm advocate of compulsory arbitration of labor disputes. This proposal was successfully opposed by the employers who selfishly believed in their own power to break strikes through starvation and force rather than by equitable arbitration of the causes of dispute.

The anthracite coal operators were the first in the mining world to act upon a broad vision of equity and good policy, and for many years the anthracite industry through its Anthracite Board of Conciliation had less trouble with its employes than any other branch of industry of comparative importance. During those years, the organization of the anthracite workers was of material advantage in that it was possible to secure, generally speaking, the approval of the acts of the board of conciliation. The MINING CONGRESS JOURNAL believes that not only in this field, but in every other field where organized labor has kept within its lawful rights, that the organization has been a distinct advantage, but whenever and wherever organized labor has undertaken to gain its ends by discrimination against other workers or through efforts in combination which are prohibited by the Sherman law; to starve the consumer into submission, it has been a distinct and unmistakable detriment to public society.

Organized labor and organized capital should stand equally before the law. Organized labor cannot hold public confidence so long as it harbors within its ranks recognized criminals, or so long as it justifies criminal acts of these men on the ground that such acts are necessary to secure for organized labor the conditions which it demands. Organized labor cannot justify its refusal in the anthracite field to accept the high war peak scale of wages for a temporary period, and its insistence that the public should be deprived of anthracite coal unless a long time contract at war peak wages was granted them. Organized labor must rid itself of that which is illegal and criminal within its ranks. It must stand for those things which are within the law as applied to all others, if it is to justify itself before the public. The MINING CONGRESS JOURNAL is opposed to organized labor as it now functions. It is heartily in favor of organized labor which will work within the provisions of the law.

A CHALLENGE TO GOVERNMENT

AN APPEAL to the courts is seldom taken by one who has power to enforce his demands independently. The difference between savagery and civilization is the difference between the enforced surrender of the weaker to the stronger and a government which intervenes to protect the weak, requiring the stronger to establish his rights in a court of competent jurisdiction. A refusal to submit a dispute which affects the public interest to a judicial tribunal for determination is a challenge to organized government. It is the longest step which the particular interest can take toward barbarism.

Where all disputes are settled by force there is no government. Civilization, the rights and privileges of mankind, the duties and responsibilities of mankind, all depend upon whether a government through its judicial bodies, shall enforce the rights and protect the liberties of its people or whether these disputes are to be settled by force and violence.

TRIFLING WITH INEXORABLE LAWS

THE LAWS of gravitation and of supply and demand were in operation long before Sir Isaac Newton first announced his theory and long before the world at large had any conception of the law of supply and demand.

These laws have been inexorable. No human power has ever been able to set either aside for any length of time. Every temporary setting aside of the law of supply and demand by artificial means has called for the passage of a score of laws to right the disturbed condition.

Price has ever been the main-spring which inspires human activity. Scarcity of a given article for which there is a demand always enhances its price. The enhanced price always stimulates human activity to supply this demand just in proportion to the profits available. If the price is so high as to create an unusual profit, production is unduly stimulated, an over-supply is created, and the market-price drops. No other law is required to accomplish this result in any field in which monopolistic control of the basic material is impossible.

The trend of price and production throughout the modern commercial world inevitably shows the same record—too high a price always stimulates over-production, which results in an overstocked market, a falling of prices and a stoppage in production. This condition always produces an exhausted market, again followed by high prices. One from a very large number of illustrations will be given:

Before the war, the zinc industry of the United States was made stagnant by the importation of zinc ores from other countries where production costs were less than our own. The price of zinc before the war was from four to six cents per pound. Increased war uses and the curtailment of importation increased the price of zinc to above 30 cents per pound. The Administration at Washington immediately made preparation to enact laws which would curb profiteering by the producers. Before the Administration could act the high price so stimulated production that the price dropped to about seven cents per pound, which was less than the actual war cost of production and this price continued practically throughout the war period.

The law of supply and demand had curbed the profiteers long before the government could get under way with its effort to attempt interference in an artificial way. If the government's price-fixing agency had been able to get in operation soon enough, there is little doubt that the price of zinc would have been fixed at from 12 to 16 cents per pound, and that price would have remained in force during the war.

If the lesson of zinc could have been applied to coal production at the beginning of the war, the American public would then have been better off by many millions of dollars and the coal producers would have been better off than they now are.

While it is true that a few coal producers have made large profits, it is also true that the great majority of the conservative coal producers of the country are not profiting by the enormous fluctuations in coal prices. Reasonable prices would have prevailed, notwithstanding the fact that there is a continual interference with the law of supply and demand as applied to coal by labor organizations, both to production and transportation. Instead of curbing those who interfere with the law of supply and demand, the federal Congress and the legislatures of several states are piling up additional laws on the statute books, which, by disturbing natural laws, will call for additional laws to settle the disturbances caused by the first.

And thus the merry pace continues around and around the endless circle.

COAL'S SELF GOVERNMENT

THE FIRST ESSENTIAL to self government is self control.

Self control, for an industry, requires two things:

First, submission to recognized leadership.

Second, willingness to waive an opportunity for personal profit in the interest of the good name and favorable standing of the whole industry.

The coal industry has been lacking in both elements of self government. But it is veering steadily and surely around in both directions.

In considering this subject, it should be recognized that it was only five years ago in June that any self government in the industry was thought advisable or would even be permitted if it should be established. It was not until the Lane-Peabody conference in Washington—as a result of only nine months of high prices—that it was thought advisable to have self government in coal. And, even then, it was only thought that self government would be advisable for the period of the war.

The demand came suddenly. Impatience for results came on the heels of the demand. The government that was to be set up was to endure only for the period of the war. It was realized and said that the war scheme should not live beyond the period of the war. The industry was thus asked to do a great job of a temporary character.

It should now be realized that this industry spreads over twenty-six states and embraces something more than 10,000 mines. It took far more than five years to draft the Constitution of the United States. It should be admitted that it must take at least five years for the coal industry to formulate a government for itself which will fit into the demands of the old anti-trust laws and the new and unauthorized demands for cooperative effort. If the industry is a little slow in doing what is almost impossible, the people should have a little patience.

In the old days of unlimited competition and of widespread loss and bankruptcy, the industry had no rewards which would attract either the capital which brings its leadership with it or the men of daring and broad vision who naturally assume leadership wherever they go. Men of the skill, the daring and the broad grasp of things such as Mr. Peabody was, are very rare in the coal fields. If the leadership in the industry has not been forthcoming we should look behind the fact to the cause and not be too impatient with an industry which did not produce that which the industry itself did not invite.

If we look into the matter of self restraint in times of emergency, we have to remember that the industry has been set a very bad example by the people who buy the coal and the people who make the laws. For years and years, the coal industry harangued the country with the story of its poverty. The people laughed at the story. The legislators built ever more stringent laws to keep competition vigorous. And, the users of coal took the last ounce of advantage in the matter of price. The coal industry was thus taught that the whole scheme of things was designed to reduce the industry to bankruptcy. It was inspired with the belief that it ought to

retaliate by taking the top price when the occasion offered.

Today, however, the industry is veering toward new things. Such men as J. G. Bradley are appearing in bituminous and S. D. Warriner in anthracite to lead the industry into better relations with the people. And the trade is showing a strong disposition to follow.

Also, today, the industry is measuring its price by considerations of public policy rather than by the desire of the individual to profit. We see a very hopeful tendency in the trade. It would be, indeed, a misfortune if the government should destroy this tendency just when it is about to develop and begin to bear fruit.

THE SURRENDER OF GARY

THE FIGHT for deflation is temporarily lost. The economic sense of America has been contending for a lower price level, and in every other line except railroads and coal mining more or less reduction has taken place. It has been conceded that prices cannot permanently remain at a very much higher level in one section of the country than in another after giving due consideration to the differences in location.

But in substantially similar employment, wages cannot remain at $7.50 per day in the coal mines while in the metal mines $4.50 per day is the highest wage the business will stand. After making due allowance for the freighting conditions and cost of living, labor like any other commodity will seek the point of greatest demand as evidenced by the wage scale.

The coal miners have won their fight for the high level of wages. Railroad workers have maintained their wages at a comparatively high level. These rates having been established by mandate of a well disciplined and well equipped army, the leveling process which every interest of the country requires should be down was immediately started on the upward plane. Immediately upon the acceptance of the Lewis mandate in the coal industry the U. S. Steel Corporation announced an advance of wages to all its employes to a wage scale 82 percent above the pre-war average. The non-union coal operators of the country immediately advanced the coal miners wages to meet the scale fixed by the unions. This is probably the beginning of an upward trend in price levels which is likely to sweep this country. Much of astonishment was felt by business men all over the country because of Judge Gary's surrender which was regarded as an admission that the fight for normalcy had been lost.

Higher wage scales in the steel industry mean higher prices for steel. Higher wages in the coal industry mean higher priced coal. Higher wages in other lines mean higher priced commodities for steel and coal workers, so that in the end little will be gained by any and much will be lost by all. The maintenance of our wage scales upon too high a level will make impossible the sale of our surplus production in foreign markets. Judge Gary surrendered to a situation which prevails because organized labor had the power to enforce its un-economical demand. There is little use for others less fortunately situated to undertake to further strike towards normal conditions. Let us enter cheerfully into the second period of inflation leading all things up to the higher level so that when deflation does come, as it necessarily must come in due time, suffering and punishment may be applied uniformly to the back of the nation. In the end the world's supply of metallic money will determine the level of prices.

THE MISTAKES OF MOSES

ROBERT G. INGERSOLL won for himself a reputation as an agnostic because he dared point out the misdirected efforts of the author of the decalogue. The coal industry has been looking for a Moses to lead it out of a certain economic wilderness into which its wanderings have landed it. Many volunteers have appeared—some quite recently. At the risk of sharing the bad name of Mr. Ingersoll, we venture to call attention to two mistakes which these modern Moseses have made.

The basic fault—if it is a fault—of the coal industry is that its commodity is one of the natural resources. This particular resource happens to be quite abundant. Indeed, it is so abundant that no one can foresee the end of the available and known supply. It is extremely unlikely that man will depend upon steam power until the end of the coal pile has been reached.

As a natural resource, coal is something the supply of which is put down once and for all time. Mr. Gladstone aptly phrased it when he said that "It has no seedtime and but one harvest." When, by our laws and our theory of economics, all of this coal is made available for immediate production, it may be expected that a rise of the general level of prices to the point where coal mining is uniformly profitable will bring under development more mines than immediately are needed or are likely to be needed.

Facing that situation, the various Moseses who have arisen in the coal fields and in the government have tried to control everything except the supply of coal itself. We maintain that until the supply of coal is controlled, it is a waste of effort to try to control the mines, the product of the mines or the human nature that is engaged in the coal business. We say therefore that the first mistake of the coal Moses has been to try to control something which is, in itself, not a controlling factor.

Coal produced is of no value unless it is at the point where it is going to be consumed. That is, coal production without transportation and distribution is useless. Also, if there is—as there is—an abundance of productive capacity in the mines; if those mines are willing and eager to produce; and if prices still are high at the market, the indications are infallible that the shortage is at the market. If there is more coal than is needed at the mines and if there is less than enough coal at the market, the indications are clear that the transportation line between the mines and the market has broken down.

Confronted by identically that demonstration again and again, the modern Moseses of the coal industry have tried to correct the shortage of transportation by an effort to regulate—by law and otherwise—the price of coal down to the level that is thought "reasonable."

Our contention is that the second mistake of the modern Moses is that he tried to correct a tendency in coal rather than applying the cure to the real cause, which is transportation. We mention this because it applies to more things than coal. We have a nation of people who are restless because of high prices. We have, in nearly every market, a shortage of essential things at the market. We have everywhere the same indication of an abundance of productive capacity at the initial point. The indications are all too clear that our transportation is not adequate.

With all these things in mind, we feel that suggestions to boost prices when the coal in the ground is not controlled and that efforts to depress prices when transportation facilities are wanting, are somewhat beside the point. These efforts sum up the mistakes in recent attempts to regulate the coal industry.

THE FUTURE OF THE BITUMINOUS COAL INDUSTRY

IT IS ALWAYS difficult to surrender an accustomed privilege. The stockmen of the west were filled with indignation when the United States Forestry Service required a small grazing charge for use of the Forestry Reserve, even though the fund was used for making the grazing lands more productive and even though the payment secured exclusive privileges.

In due time it was found that the restrictions imposed were a real benefit.

The consumers of coal who for a number of years have purchased at less than cost of production, resent paying an increased price. For six years before the war the average selling price throughout the entire United States of bituminous coal at the mine was $1.12 per ton. This represented an average loss of approximately 20 cents per ton upon the total output. Then, as now, the coal operator was unjustly considered as "the prince of profiteers."

When in the early days of the war the price of coal began to advance along with an increasing price for all other commodities, coal prices were criticised more than those in any other line, although other increased costs were comparatively very much greater. During the several years before the war, the productive capacity of the bituminous coal mines of the United States was approximately one-third greater than the possible consumption. During those years, there was a gradual reduction of the number of mines in operation. During the war the number of mines increased approximately from 6,000 to 10,000.

This over-development made it possible to produce practically double the amount of coal which the country could consume. Approximately 700,000 men are employed in the bituminous coal mines. At least one-third of these men could be employed in other lines and the remaining men could furnish all the coal which the country can possibly consume if given reasonable continuity of service. It has been estimated that the over-development of our bituminous coal mines calls for a wasted expense of approximately $400,000,000 annually. Such an enormous waste would quickly lead to combined control in any other industry than bituminous coal mining.

In bituminous coal, a monopoly is practically impossible. If it were possible, it may be assumed that some farsighted captain of industry would devise plans by which this $400,000,000 annual waste could be saved and turned into a profit. Various remedies are proposed by which the country shall be relieved from this enormous waste. Roughly speaking, there is two billion dollars invested in the bituminous coal industry. To reduce this productive capacity one-third would be a direct and immediate loss in excess of one-half billion dollars. It would also mean the release of 200,000 men whose service is now badly needed in other industries. These surplus employes, in other industries, at an annual wage of $1,500 would in two years earn an aggregate of $600,000,000, which would more than offset the loss occasioned by the scrapping of one-third of our bituminous coal mine capacity. This would not transfer this earning to the owners of the dismantled coal mines, but the country as a whole would be better off by this transaction.

One thing seems certain and that is that the bituminous coal business must be and will be reorganized either by those who now own it or by the financial and transportation interests which are involved. The public interest requires that it should be organized by practical mining men rather than by the banks and the railroads. The bituminous coal industry is going to be organized upon a basis which will avoid this enormous waste. At present we are entering upon a terrific struggle in which those mines which can operate most efficiently will survive and the less efficiently operated mines will be forced into bankruptcy.

It is almost startling to consider the fearful and wasteful struggle required to force four thousand business organizations into bankruptcy, which means that the mine operator shall sell coal for enough less than it costs him to produce it during a term of years to wipe out his original capital and leave him a bankrupt. A coal consumer may look upon this process as one which furnishes cheap coal to him, but in the end he may anticipate that this loss will be added to the cost of coal and that what he saves this year will be more than paid back at a later time. During many years the only profit made by the bituminous coal operator has been made possible either by a war, by a railroad strike or a miners' strike. It is a bad condition which makes it impossible for a business so fundamental as coal mining not to be able to make a profit during ordinary times. The future of the bituminous coal industry is filled with doubt and unless intelligent foresight shall furnish a solution, the sole question involved will be the survival of the fittest.

TRADING WRECKS

GLORIFICATION OVER the murder of fellow workmen ought to lead the guilty boaster directly to the goal of all arch-criminals—the gallows. Four striking shopmen from the New York Central Railroad entered into an agreement with striking shopmen of the Michigan Central to trade wrecks. The Michigan Central striking shopmen were to wreck trains on the New York Central in consideration of which the New York Central strikers were to wreck trains upon the Michigan Central. One of the four who has confessed to this crime, Husolis by name, describes the operation as follows:

"I attended a meeting of the union on Saturday morning (August 19) at 10 o'clock. The head man named several pickets and he told us there was some other work to be done. He picked out four of us and we were instructed to wreck the train. We went on a street car to Gary and that night walked out to the point where the wreck was to be made. Some other men already had loosened the plate. One of our men was drunk and a man named Ellesso wrested the crow bar away from him as he was afraid he would disconnect the wires on the rails and give an alarm. Ellesso pulled most of the spikes and we eased the rails over and respiked them. Then we took a street car back to Chicago. We loosened the plate and pulled the rails out, so everybody would think it was a rotted equipment that caused the wreck. What did we care how many we killed? What's the difference? Passenger or freight, it was all the same to us. We wanted to kill the fireman and engineer. The others wouldn't run trains if we killed a few engineers and a few firemen."

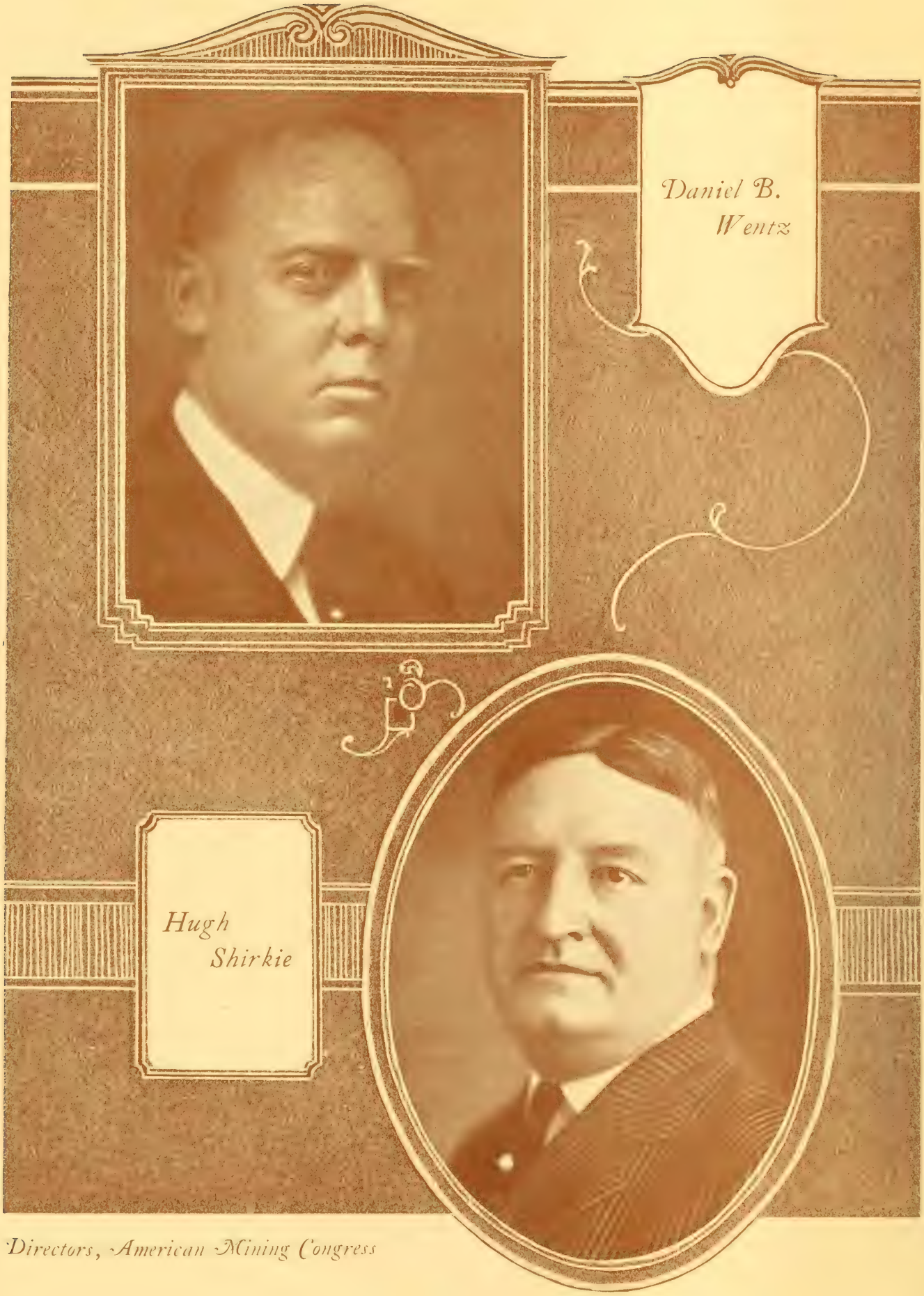
If this contract to trade wrecks is carried out we may expect the wrecking of a New York Central train or trains. When men boast of the murder of their inoffensive fellow workmen who are called upon to pay the death penalty because of the performance of their duty, it would seem that these criminals must count upon a large following somewhere who would regard as heroes those who thus boast of a criminal accomplishment.

W. J. Loring

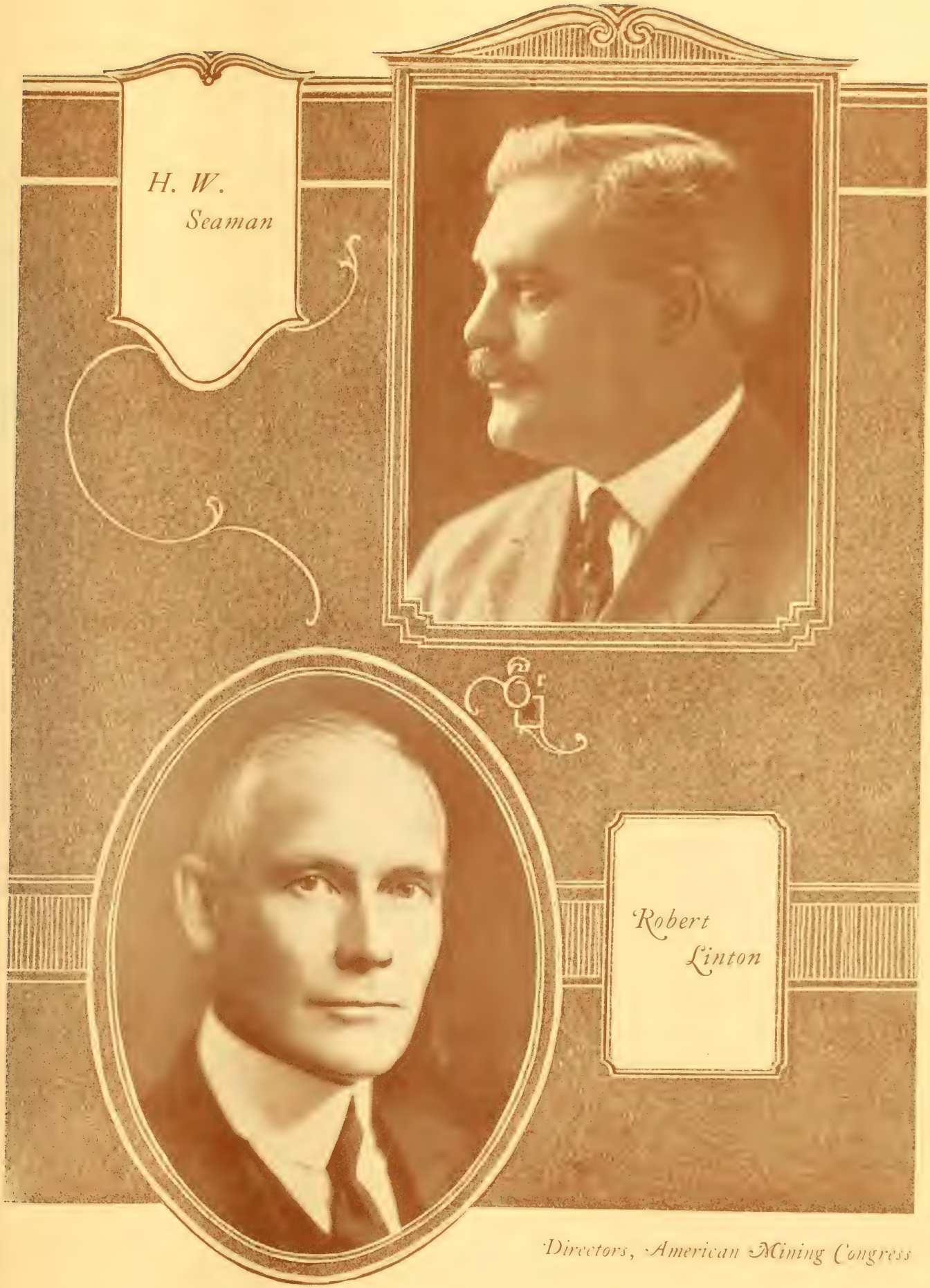
President, American Mining Congress

Directors, American Mining Congress

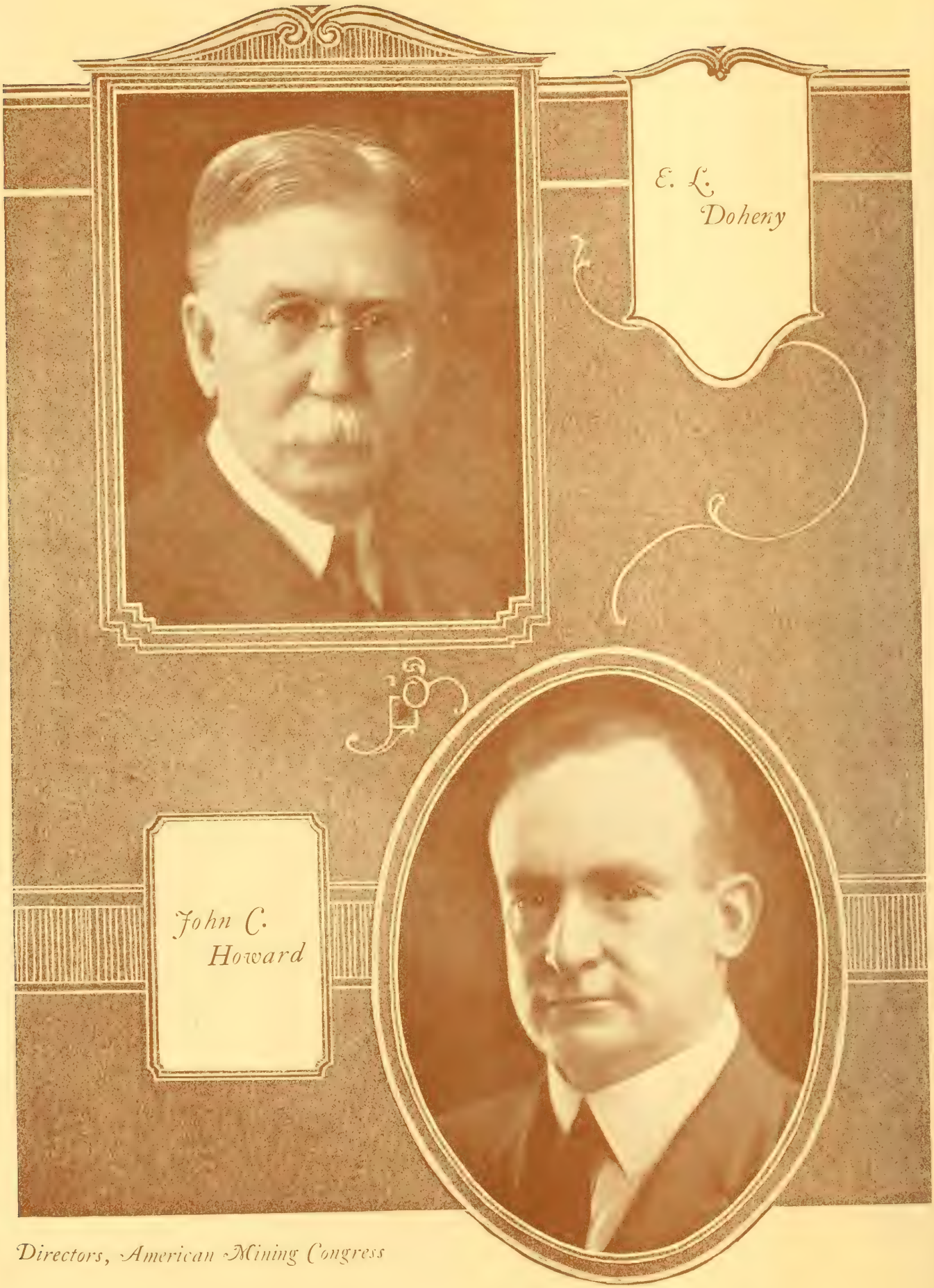
Directors, American Mining Congress



Directors, American Mining Congress



Directors, American Mining Congress



Directors, American Mining Congress

The American Mining Congress

(ORGANIZED IN 1898)

Its Purpose

THE creation of a Federal Department of Mines.

To stimulate production of our commercial minerals, that our country in war time may be self-sufficient, and in peace time labor may be employed.

To secure a just system of taxation in order that the government may receive the greatest possible revenue without unduly burdening the industry.

The enactment of a sound National Blue Sky law, that will promote and not retard mining development.

The adoption of standards for mining methods, practice and equipment that will eliminate the present great waste.

Correlation of facts surrounding the production of all minerals, to be available to the industry and to members of the United States Congress.

A Division of Industrial Cooperation, looking to a closer relationship between employer and employe in order to bring about industrial peace.

A closer cooperation between manufacturer and producer looking to a greater utilization of labor-saving machinery and our low-grade ores.

To keep the industry completely informed at all times concerning matters of national importance in which it is involved.

Its Achievement

THE creation of the United States Bureau of Mines.

As an unofficial intermediary, it has served both the operator and government in helping solve the peculiar problems that inherently attach to the mineral industry.

Its work in securing the recognition of mining as a "wasting industry" by the inclusion in the Revenue law of the depletion and depreciation clauses has been of untold value to the industry.

Intelligent presentation of facts resulted in a measure of protection in the Fordney-McCumber bill that is gratifying, and for the first time in the history of tariffs, gives proper protection to raw minerals.

The Standardization Division is recognized as an authority, and is receiving endorsement from those familiar with its efforts.

The Pittman bill has made it possible for silver mines to produce and to employ labor when the need for employment was the greatest.

Work done in behalf of gold formed the basis for exemption from excess profits tax, resulting in substantial refunds of taxes unjustly assessed.

The creation of an Oil Shale Division presages an investigation of Shale possibilities that cannot but be beneficial to the industry.

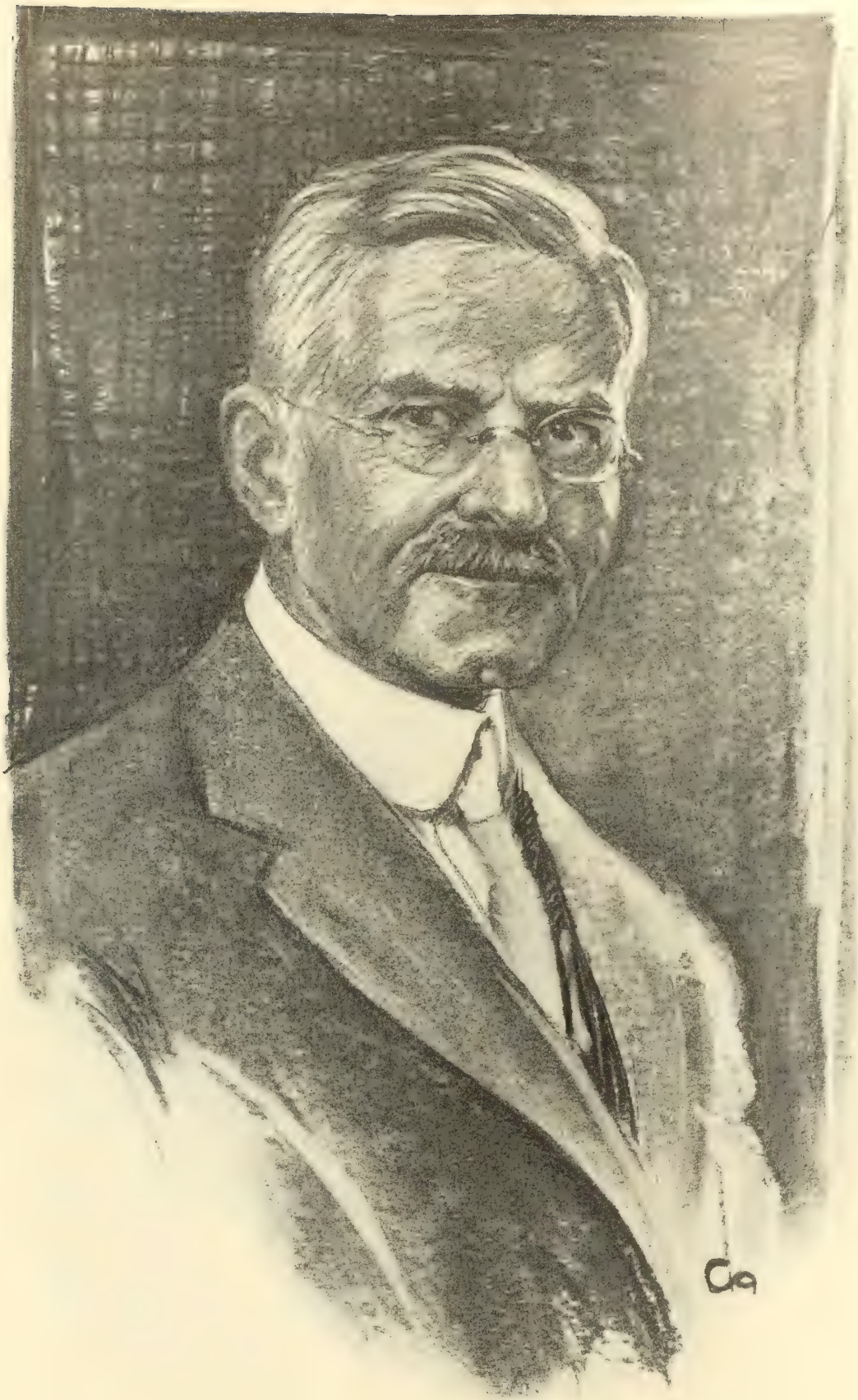
The War Minerals bill made available eight million dollars for disbursement to producers who met the government's urgent request, thereby sustaining heavy losses.

The Annual Conventions and Expositions are the recognized meeting place of the entire industry, where essential problems are discussed and basic policies formed.

The establishment through annual conventions and expositions of a place of meeting where manufacturer and operator may unite in their efforts to make mining the most efficient industry.

By cooperative effort it has been doing its work quietly for 25 years. It has stood solidly for right and justice in public matters. It stands for protective and constructive laws, and against obstructive and destructive laws.

The American Mining Congress stands upon its past record of accomplishment



James F. Callbreath
Secretary, American Mining Congress

MINING CONGRESS TO CELEBRATE ANNIVERSARY

Annual Convention to be Held at Cleveland, October 9-14, Will Mark Organization's Twenty-Fifth Year—Meeting Will See Plans Drawn as Mining Industry Faces Cross-Roads of Destiny—To Be of Broad National Scope

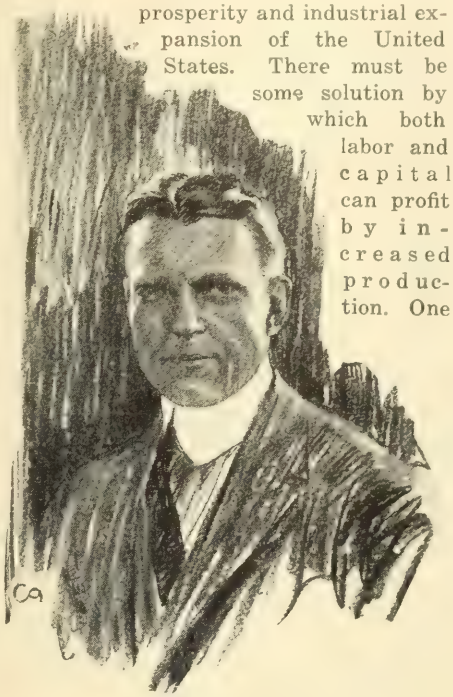
LARGE INDUSTRIAL conventions in the United States have become a necessary and almost indispensable factor in the initiation and development of national policies of benefit to industry and to the public. The value of such conventions is measured by the degree to which they are representative of industry and of the nation and by the effectiveness of the constructive policies which they inaugurate.

The conventions of the American Mining Congress are now recognized as the "Annual Meeting Place" of the representatives of every branch of the mining industry. At Chicago, one year ago, forty-two states were represented by delegation and there also were important representatives from Alaska, Mexico and the Dominion of Canada. The Cleveland Convention will be even more national in its character and in its scope.

Of Special Significance

The Twenty-fifth Anniversary Convention of the American Mining Congress, celebrating a quarter of a century of mining development, is of special significance for the mining industry in this country seems to be standing at the crossroads of its destiny. The marvelous development of the past twenty-five years made possible by the presence of unlimited deposits of high-grade ores and unrestricted individual initiative is a thing which has gone, and it can hardly be paralleled in the future. Collective thought and cooperative effort are now essential in order to work out an effective solution of the essential problems confronting every phase of mining, and it is only possible to maintain the development of the mining industry by such cooperation and by such effort. Above everything else, national policies must be adopted, which will tend to make possible greater prosperity through lower production costs, and the aim and objective of this national celebration of twenty-five years, at Cleveland, Ohio, October 9 to 14, is to inaugurate national movements along lines which will assist in creating conditions which will result in greater efficiency, in economy and in a larger production. The Cleveland Convention will therefore emphasize throughout its sessions the following topics:

The experiences of the past year have re-emphasized the needless waste resulting from the unending strife between labor and capital. Industries have suffered, the public as a whole has suffered, and the laborer has suffered. As long as the present antagonism between organized labor and industry exists it will always be a continuing hindrance to the prosperity and industrial expansion of the United States. There must be some solution by which both labor and capital can profit by increased production. One



E. C. PORTER
Convention Manager

of the most interesting sessions of the entire Convention at Cleveland will, therefore, be devoted to the topic of "Industrial Cooperation." Representative industrial executives, who, through practical experiments, have established policies which have broken down the barriers of hostility and antagonism between employer and employe, and have created greater mutual confidence resulting in benefit to all concerned, will present their point of view for consideration in the hope that under proper and wise leadership it may be possible to inaugurate a national movement along the lines of industrial cooperation.

The steady increase in the centralization of governmental powers in the national government at Washington and the increased industrial costs resulting from the continued encroachment of governmental paternalism over individual initiative and individual enterprises is a menace to American industry, particularly the mining industry. For this reason, the Cleveland Convention will devote considerable time to a discussion of the question of the function of government in relation to industry, in the hope that it will be possible to work out a national program which will result in an effective and united protest against further governmental supervision and restriction of industry.

Western mining interests are directly affected by the proposed Blue-Sky legislation and while every mining man is opposed to the fraudulent sale of mining securities, still the proposed legislation will tend to hamper individual incentive and to prevent the independent financing of mining enterprises. Leaders of the administration in Washington, who are sympathetic to the point of view of industy will present a message to the convention which should have the unified support of mining men.

Mining Directly Affected

Standardization eliminates waste and the Standardization Division of the American Mining Congress has laid a solid foundation for further development. The Third National Standardization Conference, to be held at Cleveland, will therefore be of particular significance and value to all mine operators and operating men, and also to the manufacturers of mine equipment and mine machinery.

The problem of Mine Taxation is a complicated one and the mining industry has suffered from an oppressive and in some cases discriminatory burden of Federal Taxation as applied to mining industry. The Tax Division of the American Mining Congress has performed admirable work through its representative tax committee in laying a foundation of common agreement which may make possible the inauguration of a policy relative to Mine Taxation which will be fair, sound and practical.

The Mine Tax Conferences, which will be held on Monday, October 9, Tuesday, October 10 and Wednesday, October 11, will be of particular interest to all mining men who will have an opportunity of hearing experts present their point of view in regard to tax problems, and of participating in the general discussion which will follow.

Modification of Sherman Law

The Sherman Anti-Trust Law in the minds of many has become a definite barrier to obtaining greater efficiency and economy in the production and distribution of products in this country. The advantages of industrial cooperative combinations, both to the consumer and the producer, have been noticeably shown in connection with the production of agricultural products, and particularly

in the work of the cooperative fruit exchanges. The desirability of initiating a national movement to bring about a proper and wise modification of the Sherman law will be discussed at the Cleveland Convention, and there will be an opportunity to focus the collective thought of the industry upon this vital question.

BURTON BUNCH
Western Secretary, American Mining Congress

During the last few years the coal mining industry has been continually in the spotlight of public attention. Crises in the coal industry have become chronic and the adjustments which have been made are usually only of a temporary nature, resulting in continual conflict and reaching no stable solution. The point of view of both bituminous and anthracite coal operators will be presented at the Cleveland Convention in the hope that the representative conference of coal operators at the convention may develop lines of thought which will be of value to the industry as a whole.

Conferences of Metal Producers

While there has been a revival in western metal mining, the problems confronting the producers of gold and silver, of copper, lead and zinc, and other minerals, are of national importance. It is evident that there must be a stimulation in the production of gold and of silver, and the conferences devoted to this problem at Cleveland may result in the development of policies which will be of value both to the producers and to the nation.

The chief problem confronting the producers of copper, lead and zinc, is to bring about an increased utilization of these metal products, and considerable work is being done by various special organizations devoted to this purpose and representatives of these organizations will present their point of view at Cleveland.

The Oil-Shale industry presents interesting possibilities for future development. The Oil-Shale Conferences at Cleveland will enable delegates to enter into a discussion of the problems of the Oil-Shale industry and there will be a noticeable exhibit of Oil-Shale possibilities on the exposition floor, which is being sent forward under the auspices of the Colorado State School of Mines.

There will be a number of special features along entertainment lines for delegates and their wives at Cleveland. Opportunity will be given for seeing the splendid system of ore unloading, at one of the great ore docks at Cleveland, and a special trip has been arranged for technical delegates to visit one of the largest stone crushing and quarry plants in this country.

The Exhibitors' Smoker will again be a feature of the Convention week, and the Annual Banquet at the Hollenden Hotel on Friday will be truly representative of the mining industry.

TO DEVELOP SOUTHERN MINERAL EMPIRE

DETERMINATION to capitalize every possibility held by the South for the mining industry will be the spirit under which the Southern Division of the American Mining Congress, organized at Chattanooga by mining men attending a meeting held September 29, will operate. By closer cooperation, leading to a better perception and more immediate solution of mutual problems, members of the newly created division of the national mining organization propose to take advantage of many benefits which hitherto have received much less than the amount of attention they deserve.

Opportunity Is Present

Opportunity for the southern mineral industry stands close at hand, as a result of protective provisions for a number of mine products included in the tariff bill. Duties imposed upon foreign importations of manganese, mica, bauxite and graphite will offer those engaged in the production of these minerals a stimulation which will enable them to add materially to the economic strength and prosperity of the South as a whole.

With the revenue relations between industry and the government always of vital importance, the subject came prominently before the Chattanooga meeting, special consideration being given the taxes levied by states and municipalities. It is a fact that the low production level of the industry is due in no small measure to burdensome taxation, and the basis of an effort to secure elimination of this handicap to as great a degree as possible was the goal at which the conferees aimed.

Broadly, the division will work to realize for the industry the development of cheap power and transportation. The Chattanooga meeting met with this plan before it, and with the Muscle Shoals and the rail strike situations making bids for immediate attention.

Leaders who addressed the meeting pointed out that the mining industry in the southern states cannot hope to develop to its fullest possibilities until cheap power and highly efficient transportation systems enable operations to be carried on along a scale approximating the handling of vast amounts of ores in the porphyry copper developments of the West.

With the development of cheap power in view, the American Mining Congress, through the consolidation of its chapters in the southern states affected by the meeting, has placed its entire organization behind the completion of the Muscle Shoals project. In discussing this point, James F. Callbreath, secretary of the congress, who addressed the meeting, said:

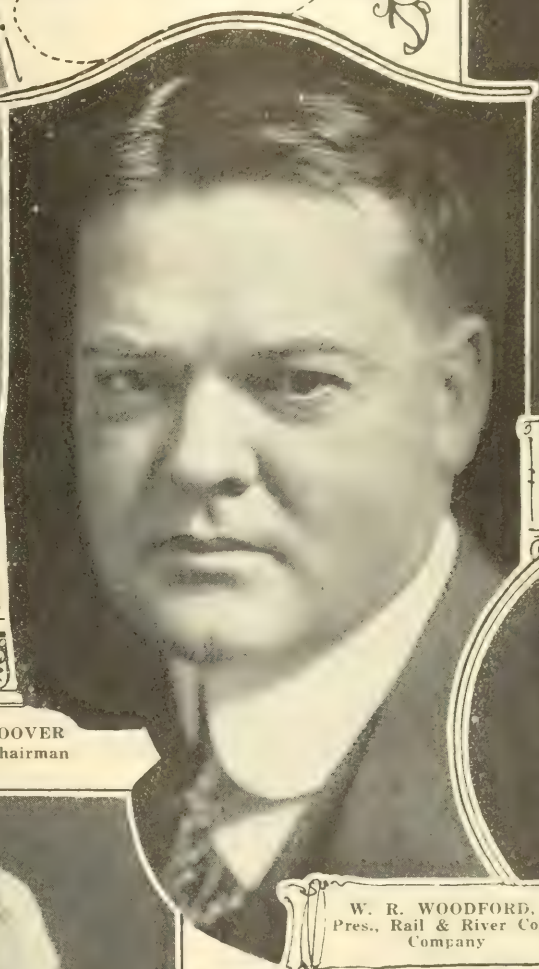
Basis of Development

"The development of the Muscle Shoals project is essential, first, for transportation; second, for cheap power; and third, because its completion, combined with the proximity of the great mineral resources of the South to the natural markets and superior supply of labor, creates the possibilities of a great Southern Mineral Empire, which can compete with the products of any other region.

"The widely diversified and disseminated deposits of graphite, phosphate, manganese, barytes, pyrites and other minerals in the southern states and their successful marketing call for collective thought and collective action. The constructive work of the American Mining Congress in behalf of the mining industry during the past twenty-five years entitles it to the heartiest support, complete endorsement and active cooperation of every man interested in the industrial development of the South."

Chairmen of Cleveland Convention Committees

RICHARD F. GRANT,
M. A. Hanna & Co.
Chairman, Arrangements
Committee



HERBERT C. HOOVER
Honorary Chairman

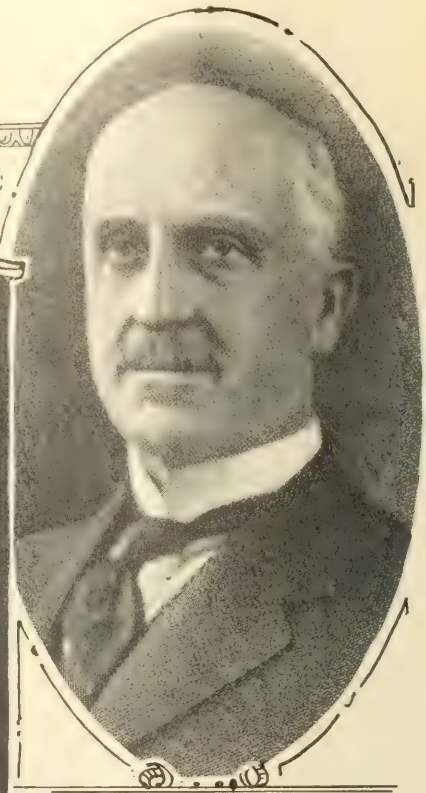
JOHN A. PENTON, Publisher
Iron Trade Review
Vice Chairman, Arrangements
Committee

W. R. WOODFORD,
Pres., Rail & River Coal
Company

MICHAEL GALLAGHER,
M. A. Hanna & Co.
Chairman Speakers'
Committee

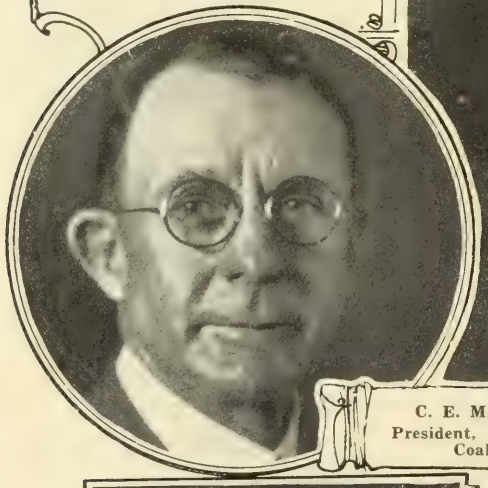
CHAS. E. ADAMS, Pres.,
Cleveland Hardware Co.
Chairman, Exposition
Committee

J. J. BERNETT,
President, New York, Chicago & St. Louis Railway

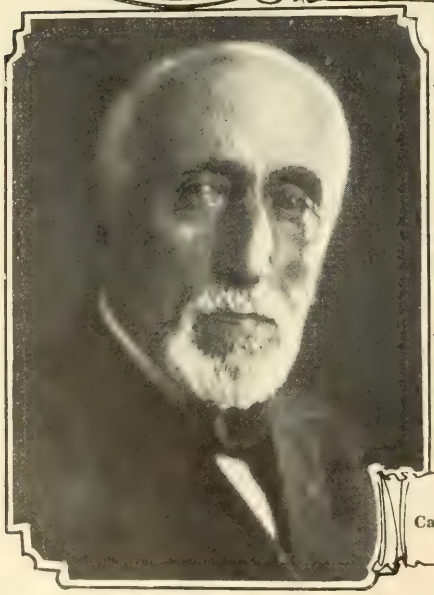


T. K. MAHER,
President, Maher Collieries Co.

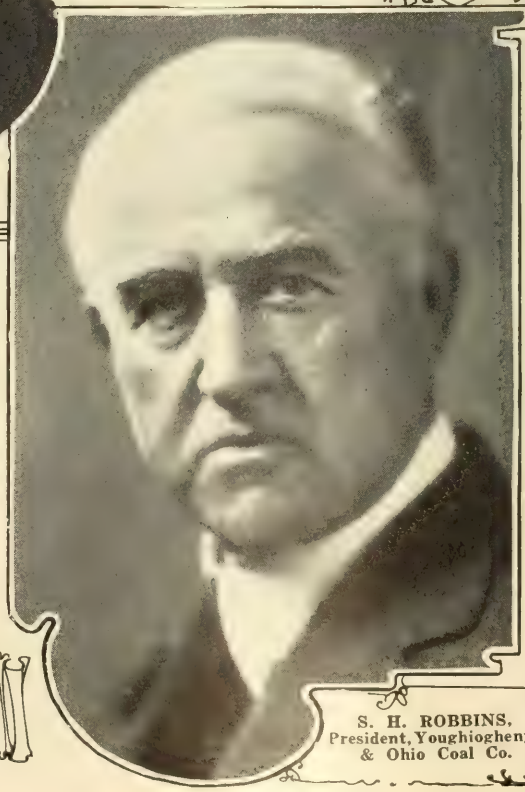
NEWTON D. BAKER,
President, Cleveland Chamber of Commerce



C. E. MAURER,
President, Glens Run Coal Co.



CHARLES BRIGGS,
Calumet & Arizona Copper Co.



S. H. ROBBINS,
President, Youghiogheny & Ohio Coal Co.

Members of the Cleveland Committee on Arrangements

BENEDICT CROWELL,
Crowell & Murray

CARMI A. THOMPSON,
Tod-Stambaugh Co.

CLAUDE J. PECK,
Shenango Furnace Co.

FRANK B. FRETTER, Pres.,
Nat'l Refining Co.

JOHN A. KLING,
President, Kelly Island Lime & Transport Co.

CRISPIN OGLEBAY,
Ogiebay-Norton & Co

Members of Exposition Committees Cleveland Convention.

A. S. GOULD,
Oster Mfg. Co.

GEORGE H. HALL,
Cleveland Rock Drill Co.

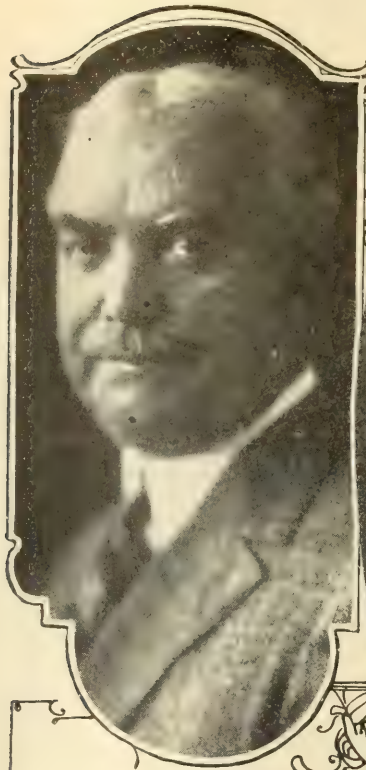
JAMES R. MILLS,
Carnegie Steel Co.

M. P. REYNOLDS,
W. S. Tyler Co.

FRANK A. SCOTT,
Warner & Swasey Co.

EDWIN S. CHURCH,
Wellman-Seaver-
Morgan Co.

Members of Exposition Committee, Cleveland Convention



S. D. WRIGHT,
Atlas Car & Mfg. Co.

W. J. HANLEY,
General Electric Co.

A. E. REED,
W. S. Tyler Co.

H. L. McKINNON,
Bartlett & Snow Co.

W. E. HUBER,
Electric Railway Improvement Company

JOHN ANDREWS, Jr.,
Westinghouse Electric & Mfg. Co.

Members of Cleveland Committee on Arrangements

LIST OF EXPOSITION EXHIBITORS

American Car & Foundry Co., Chicago; Allis-Chalmers Mfg. Co., Milwaukee; Automatic Reclosing Circuit-Breaker Co., Columbus; American Steel & Wire Co., Chicago; Aldrich Pump Co., Pittsburgh; American Mine Door Co., Canton; American Brake Shoe & Foundry Co., New York; Austin Machinery Corp., Chicago; American Blower Co., Detroit; Atlas Car & Mfg. Co., Cleveland; Austin Powder Co., Cleveland.

Black Diamond, Chicago; Buckeye Welding & Supply Co., Columbus; Brown Hoisting Machinery Co., Cleveland; Bock Bearing Co., Toledo; C. O. Barlett & Snow Co., Cleveland; Buckeye Blower Co., Columbus; Bristol Recording Co., New York; Bethlehem Steel Co., Cleveland; Conneaut Shovel Co., Conneaut, Ohio; Cleveland Rock Drill Co., Cleveland; James H. Channon Mfg. Co., Chicago; Clinton Refrigerator Co., Clinton.

Coal Age, New York; Carnegie Steel Co., Pittsburgh; Chrisman Foundry Co., Morgantown, W. Va.; E. I. DuPont de Nemours & Co., Wilmington; Duro Metal Products Co., Chicago; Dravo-Doyle Co., Pittsburgh; Deming Pump Co., Salem, O.; Electric Railway Improvement Co., Cleveland; Elliott Electric Co., 813 Superior West, Cleveland; Electric Storage Battery Co., Philadelphia; Easton Car & Construction Co., New York.

Edison Storage Battery Co., Orange, N. J.; Fairmont Mining Machinery Co., Fairmont, W. Va.: Federal Electric Co., Chicago; Flexible Steel Lacing Co., Chicago; J. R. Fleming & Son Co., Inc., Scranton; Fate-Root-Heath Co., Plymouth, O.; Gurney Ball-Bearing Co., Jamestown, N. Y.; General Motors Truck Co., Pontiac, Mich.; Goodman Mfg. Co., Chicago; General Electric Co., Schenectady; B. F. Goodrich Rubber Co., Akron.

Robert Holmes & Bros., Danville, Ill.; Hudson Coal Co., Scranton; Hazard Mfg. Co., Wilkes-Barre; Hyatt Roller-Bearing Co., New York; Hockensmith Wheel & Mine Car Co., Philadelphia; Hercules Powder Co., Wilmington; Hill-Clutch Co., Cleveland; Hadfield-Penfield Co., Bucyrus, O.; Ironton Engine Co., Ironton, O.; Jacobsen & Schraeder, Inc., Chicago; Jeffrey Co., Columbus; Joyce-Cridland Co., Dayton.

Kenova Mine Car Co., Kenova, W. Va.; Koehring Co., Milwaukee; Keystone Lubricating Co., Philadelphia; Keystone Consolidated Publishing Co., Pittsburgh; Kilbourne & Jacobs Co., Columbus; Ludlow-Saylor Wire Co., Newstead Avenue and Wabash R. R., St. Louis; Lunkenheimer Co., Cincinnati; Lorain Steel Co., Johnstown, Pa.; A. Leschen & Sons Rope Co., St. Louis; Lake Superior Loader Co., Duluth, Minn.

Merrick Scale Mfg. Co., Passaic; Marchant Calculating Machine Co., Oakland; Morse Chain Co., Ithaca; Morgan-Gardner Electric Co., Chicago; Mine Safety Appliances Co., Pittsburgh; Mining Safety Device Co., Bowerston, O.; Manierre Engineering & Machinery Co., Milwaukee; Myers-Whaley Co., Knoxville; Mancha Storage Battery Locomotive Co., St. Louis; R. D. Nuttall Co., Pittsburgh; National Refining Co., Cleveland.

National Coal Association, Washington: Ohio Brass Co., Mansfield, Ohio; Oster Mfg. Co., Cleveland; Oxweld Acetylene Co., Newark; Pittsburgh Machine Tool Co., Braddock, Pa.; Penton Publishing Co., Cleveland; Philadelphia Storage Battery Co., Philadelphia; Post-Glover Electric Co., Cincinnati; Pennsylvania Crusher Co., Philadelphia; Rome Wire Co., Rome, N. Y.; John A. Roebling's Sons Co., Trenton; Rock Products, Chicago.

Roberts & Schaefer Co., Chicago; Reading Steel Casting Co., Inc., Bridgeport; St. Louis Structural Steel Co., St. Louis; Southern Wheel Co., St. Louis; Safety Equipment Service Co., Cleveland; Safety Appliance Co., Huntington; Simplex Wire & Cable Co., Chicago; Streeter-Amet Weighing & Recording Co., Chicago; S. K. F. Industries, New York; Stearns Conveyor Co., Cleveland; Sanford-Day Iron Works, Knoxville.

Standard Welding Co., Cleveland; Standard Underground Cable Co., Pittsburgh; Standard Carbide Sales Co., New York; W. S. Tyler Co., Cleveland; Timken Roller-Bearing Co., Canton; Templeton, Kenley & Co., Ltd., Chicago; United Filters Corp., Hazelton, Pa.; Upson-Walton Co., Cleveland; Waterbury Co., New York; Wood Shovel & Tool Co., Piqua, O.; Wellman-Seaver-Morgan Co., Cleveland; Weinman Pump Co., Columbus.

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.; Geo. D. Whitcomb Co., Rochelle, Ill.; Watt Mining Car Wheel Co., Barnesville, Ohio; Western Wheeled Scraper Co., Aurora, Ill.; Williamsport Wire Rope Co., Chicago; U. S. Department of Agriculture; U. S. Bureau of Foreign & Domestic Commerce.

MINING EXPOSITION IS ESSENTIAL ESTABLISHMENT

Aids In Promotion of Efficiency and Economy—Enables Mine Operators To Gain Valuable Information from Equipment Manufacturers—To Be Held Oct. 9-14 in Remarkable Display Hall at Cleveland

THE NATIONAL EXPOSITION of Mines and Mine Equipment has grown from a successful experiment until it has become an essential and permanent feature of the Annual Meeting of the American Mining Congress and it takes rank as one of the largest and most comprehensive industrial expositions in this country.

The Exposition in Cleveland, Ohio, October 9-14, 1922, will tax the capacity of the largest permanent exposition building in this country, the Cleveland Public Auditorium. This is the best evidence of the value of these expositions, both to the mine operator and to the manufacturers of machinery and mine equipment. The mine operator is enabled to study and compare the latest types of labor-saving equipment and to talk over his mechanical problems with the experts in each line of mine machinery. As one of the well-known operators has said: "The discussions in the booths of the exposition are of as great value to the mining industry as the convention sessions themselves."

Of Constructive Value

In view of these facts, the American Mining Congress believes that the establishment of these displays on a permanent basis is of constructive value to the entire mining industry. They result in greater cooperation and in an increased use of adequate and proper mine equipment and mine machinery. They are, therefore, an important factor in the development of greater prosperity through lower production costs.

The exposition management is fortunate this year in being able to stage this great industrial display in what is probably the most beautiful exposition building in the United States. Many people take it for granted that an exposition of mine machinery and equipment must be just that and nothing more, but in planning for the Exposition of Mines and Mine Equipment at Cleveland, it has been possible both on account of the building and on account of the booth settings, which have been constructed for this particular event, to arrange a handsome, beautiful, and effective setting for the industrial displays on the exposition floor.

The City of Cleveland, at a cost in excess of $6,000,000, has constructed an exposition auditorium which from every standpoint is in itself a wonderful setting and a building which is well worth studying.

The Exposition of Mines and Mine Equipment will occupy both floors of the building. The ground floor is known as the Main Arena Floor, and the floor below is called the Machinery Hall.

The Main Arena is 247 feet long by 121 feet wide. The ceiling is of glass, 80 feet from the floor, back of which are hundreds of electric lights throwing a light on the floor equal to sunlight.

The Machinery Hall is the same size with a sixteen foot ceiling and a complete system of service connections for power, both electric and steam, water, gas, vacuum, compressed air, and all other types of service facilities.

JOHN E. MILLER
Exposition Superintendent

The decorations throughout the entire building are in warm silver gray with touches of blue and highlights of gold making a harmonious color scheme. In this setting have been constructed booth fixtures which will harmonize in every way with the attractive features of the building itself.

The Exposition of Mines and Mine Equipment of the American Mining Congress is unique among industrial expositions because it includes two types of exhibits—public exhibits which are representative of the work which the United States Government is doing in the development of the mining industry, and state exhibits which are illustrative of the tremendous mineral resources still to be developed in this country, and general educational exhibits which illustrate different phases of mining in an interesting way.

At the Cleveland exposition will be special exhibits from the United States Government indicating the work which the Bureau of Mines is doing in the development of safety in mines and a particularly attractive exhibit from Mexico illustrative of the limitless mineral wealth and opportunities for mining developments which abound in the republic south of the Rio Grande. There will also be an attractive display of radium from the state of Colorado placed on the exposition floor by the Colorado Metal Mining Fund and it is anticipated that there will be additional displays from several of the important mining districts.

Second Group of Exhibits

The second group of exhibits at the National Exposition of Mines and Mine Equipment consists of the display of the latest types of cost reducing and labor-saving machinery. These will number approximately one hundred and fifty, including every phase of mining and illustrating all of the latest methods which are utilized in mining enterprises.

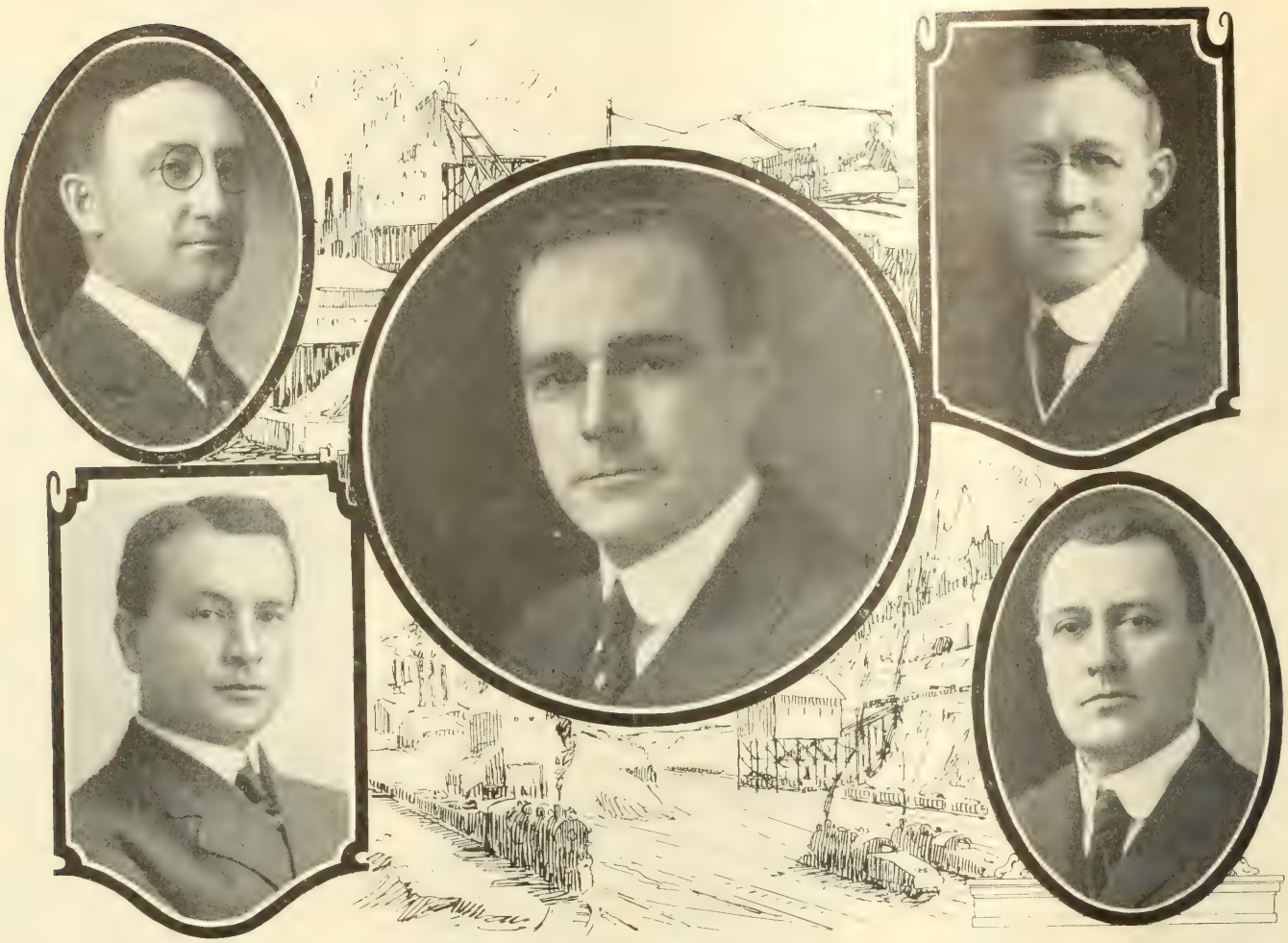
Among the notable groups will be different types of locomotives and mine cars used in the transporting of mine products in the mines and from the mines to the railroad systems. Eight types of different mine locomotives, some operated by electric trolley systems, some by storage batteries, others by steam or gasoline will be shown, and also nine or ten exhibits of different types of mine cars used in mining enterprises.

Mining tools, which have taken the place of the old type of hand-drills and hammers, are to be displayed. These exhibits will include compressed air and electrically driven drills, several of which will be shown drilling in rock.

An important problem in all mining enterprises is equipment for handling the pumping of water from mines, and on the exposition floors at Cleveland eight to ten exhibits of different types of heavy duty pumps which have proved successful in all types of mining enterprises will be exhibited.

Several weighing and recording machines, steam shovels, box car loaders, motors, generators, ventilating systems, chain and belt conveyors, hoists, electrical equipments, cutting and welding processes, motor trucks particularly adapted for the mining field, technical instruments and everything else which goes to make a complete catalog of the needed equipment for any type of mining or quarrying operation will be shown.

WESTERN DIVISION IS ORGANIZED



MEMBERS OF BOARD OF GOVERNORS, WESTERN DIVISION, AMERICAN MINING CONGRESS
Center: D. D. Muir, Jr., Salt Lake City, Chairman. Upper right: John M. Sully, Hurley, New Mexico. Lower right: William F. Word, Helena, Montana. Upper left: Robert E. Tally, Jerome, Arizona. Lower left: Sidney Norman, Spokane, Washington

BOUND BY REALIZATION of the necessity of holding a common thought and pursuing a single program in coping with problems and conditions surrounding them, members of the board of governors of the Western Division of the American Mining Congress met in Salt Lake City, September 11. The immediate purpose of the meeting was to perfect the organization of the division which was established at a conference recently held at Denver.

Definite Organization Obtained

During the interim between the two meetings, each of the western mining states had chosen representatives to serve on the board of governors, and it was these men who conferred in Salt Lake City for the purpose of attaining a more definite organization.

Among those attending the meeting were: Edwin Higgins, president of the California Metal and Mineral Producers' Association, San Francisco; George A. Stall, president of the Colorado Metal Mining Association, and M. B. Tomblin, secretary of the Colorado Metal Mining Association, the Colorado Chapter of the American Mining Congress and the Colorado Metal Mining Fund; H. E. Miller, secretary of the Idaho Mining Association of Wallace, Idaho; Robert N. Betts, president and general manager of the Cornucopia Mines Company, Oregon; A. G. Mackenzie, secretary of the Utah Chapter of the American Mining Congress, and D. D. Muir, Jr., vice governor of the Utah Chapter of the American Mining Congress and general manager of the United States Smelting, Refining & Mining Company. Sidney Norman, of Spokane, Wash., was represented by proxy.

Henry M. Rives, of Reno, Nev., secretary of the Nevada Mine Operators' Association, met with the directors to indicate the cooperation of his organization, not yet affiliated with the division.

Mr. Muir was elected permanent chairman of the board, and Mr. Mackenzie was named as secretary-treasurer.

Foremost among the subjects of discussion at the meeting was the labor shortage with which the metal mines of the West now are grappling. This situation, largely consequent upon resumption of operations by the copper properties last spring, faces the individual mining districts in a more or less acute degree, and the careful consideration it demands was accorded by the conferees.

Labor Resolution Passed

The result was the passage of a resolution holding that some semblance of stabilization be achieved and that a study of wage scales and differentials be made, and that the organization investigate causes of labor shortage.

R. C. Gemmell, assistant managing director of the Utah Copper and allied companies, appeared by invitation before the board to discuss this subject.

Other matters of detail, such as railroad rates on ores and concentrates, also on shipments of bullion, were discussed informally, but no action was taken, and it was the sense of the delegates that any pressure of these matters would be inopportune at the present time so long as the hands of the railroad executives were full in meeting strike conditions.

THE HUMAN EQUATION IN MINING

Common Welfare of Employer and Employe Demands That a Regenerative Influence Be Exercised Over Their Industrial Relations--Mutual Confidence is Prime Necessity—Cooperation Naturally Inspires Progress—Plan to be Presented at Cleveland Convention—Movement to be Directed Against Ignorance

By E. R. Coombes

HARMONY OR DISCORD between management and employe determines in no small measure the success or failure of the enterprise. Public estimate of the mining industry has been based very largely upon the discord between these two factions.

When industries were small and there were no large organizations of employers and employes, the public had little interest in their disagreements. The number of men employed by any person or company was insignificant, and it made little difference to the public if there was a lockout or a strike, but modern development of industry has placed the lockout and strike in a decidedly different aspect. Either can force intolerable suffering upon an innocent public. We can expect agitation for government interference in business when the lack of harmony between management and employe is as apparent as it is today. Something is fundamentally wrong. It is certain that there must be a clearer understanding of the situation, from the viewpoint of both employer and employed, if we are to have industrial peace. The public has been "fed up" on strikes and their attendant discomforts, and is demanding to know why it shall remain neutral and at the same time bear the brunt of the burden.

Government Takes Interest

That the government has taken a decided interest in the matter is evidenced by the creation of the Federal Coal Commission, which promises to thoroughly investigate that branch of the mining industry from the price of coal at the mouth of the mine on through the entire process of coal mining from the ownership of the mine to the wages paid, the wage contracts entered into, the conditions of employment of the working men, distribution of coal, waste in the industry, etc. It even has been suggested that the government take over and run the coal mines; that it fix the price at which coal may be sold by the producer; that the number of coal mines producing in this country be limited. All of this proposed legislation and regulation harks back to the discord that has been so apparent between management and employe.

Fundamentally, the interests of capital and labor are one. A condition detrimental to either is detrimental to both. Cooperation is the one cure for industrial unrest, which, next to war, is the greatest cause of economic waste. True cooperation means that both employer and employed shall work together for the same end — a mutual understanding that will enable them to reach a common viewpoint.

On "Organized" Basis

For a quarter of a century the mining industry has been going on the "organized" basis. The workers have been organized to protect themselves against capital. Capital has organized to protect itself against the encroachments and demands of organized labor. With each organized to fight the other, we have had industrial strife. When two nations maintain great armies, there is but one result — war. Certainly future industrial peace will not be found in organizations that are created to fight each other. There is a common ground upon which every employer and employe can meet, and this common ground is born of confi-

Proposed

DIVISION OF INDUSTRIAL COOPERATION
THE AMERICAN MINING CONGRESS

OUR PLATFORM

WE BELIEVE THAT:

(1) Industrial cooperation between employer and employe is good business.
(2) Equitable compensation and good working conditions are essentially fundamental.
(3) Paternalism in industry leads to the "Something-for-nothing" spirit, which is the very foundation of I. W. W.'ism.
(4) Intelligent selfishness is the mainspring of industrial growth.
(5) Industrial peace will be brought about only through confidence in management, and that confidence can be secured only through a closer personal touch between management and employes.
(6) Satisfied employes are the best investment any company can make, and mean millions of dollars to the mining industry.
(7) Future peace of industry will not be found in "organized employers" and "organized employes," that are created to fight each other. This has been tried for half a century and failed.
(8) There is a common ground upon which every employer and employe can meet, and that this common ground is born of confidence, and sustained through a recognition of interdependence.
(9) The mining industry needs the regenerating influence of reciprocal relations between employer and employe. There is no other road to permanent industrial peace.

OUR PURPOSE:

The American Mining Congress is the "Common-Denominator"—the non-partisan ground, the clearing house, for problems inherent to mining.

It is vitally interested in any agency that will assist in bringing about better industrial relations. Public estimate of any industry is largely determined by the harmony, or discord, between management and employe, and the public is almost invariably in sympathy with the man who labors.

There are many phases of mining that the public has never heard about that would go a long way in helping reach a proper estimate of industrial affairs in the industry. The public still believes the working man is downtrodden, crushed beneath the heel of a "soulless" corporation, or imperialistic capitalism.

When such calamities as the Herrin massacre can occur and fail to arouse the thinking people to decisive action, it is time that a fair, unbiased, committee investigate working conditions in the mining industry, and give the public facts.

We proposed to make this investigation for the industry. To make a survey of the various forms of so-called "welfare" obtaining in both the coal and metal industries; to investigate the possibilities of the various systems, and to disseminate the information widely, to the public generally.

We do not propose to make recommendations. We shall merely be the agency through which the information is gathered and distributed.

dence and sustained through the recognition of inter-dependence. Capital and labor soon must recognize this fact. One cannot survive without the other.

Duty of Brawn and Dollars

It is high time that the two greatest forces in the world today—brawn and dollars—recognize their true worth to each other and agree upon a sane policy, a policy which will insure a comfortable living wage to the employe, a fair return upon the capital invested to the employer and a reasonable market price to the consumer. Whether this be the "profit-sharing basis" or some other basis is to be determined, but it is time that the brains in labor and capital get together and in conference and counsel eliminate the great waste in the industries in our country. We have heard workers from the highest type to the Bolshevik make the statement that "capital could not produce if it were not for labor," that it is the workers that make the mine. You hear the equally combative statement that it is the capitalist who furnishes the money, who pays the wages, who buys the machinery, who takes the risk for the development of the property. But, in the final analysis, it is apparent that the workers would be jobless were it not for capital, and that capital could not be productive were it not for the workers.

If we recognize that business is a partnership between the man who employs and the employe, we will agree that it should be a friendly partnership if it is to be successful. It is essential to both the management and the men that the business should be successful. To be profitable, both capital and labor must do their share and cooperate with instead of fight each other.

America todays offers to her working men conditions such as no other nation ever has or can offer. The fundamental principle of American democracy gives to each individual the right to make a place for himself. The right of labor to organize is recognized. Equal opportunity must be given to every man, whether union or non-union, to work under the same conditions and under the full protection of our law. All citizens, whether employers or employed, stand equal before the law and before the bar of judgment of the American people. The freedom and liberty which the Constitution guarantees does not mean strife and lawlessness. No action individual or collective can be condoned or permitted which is against public welfare.

The Basis of Confidence

Suitable compensation and good working conditions are essentially fundamental. The company that operates on the cooperative basis is the successful company. Cooperation and understanding will bring industrial peace. Contented workmen are the result of confidence in management, satisfaction and interest in the thing that they are doing. Do you, as an employer of labor, really take an interest in the lives of the people on your payroll? If you do not, you cannot expect them to take any interest in you or in your business. It is certain that unrest emanates from a feeling of dissatisfaction, suspicion and a lack of interest.

Perhaps we will better understand the difficulties of the whole situation if we recall the testimony before the Senate Immigration Committee when the Americanization bill was before it. It was pointed out before this Committee that in one coal mining center there are twenty-seven foreign language newspapers; in the steel strike district, fifty-four foreign language newspapers were being circulated among our foreign-speaking aliens. Fifty-eight percent of the men employed in our iron and steel industry are foreign born; sixty-two percent of the men employed in the coal-mining industry are foreign born; 69 percent of the metal miners are foreign born and 57 percent of the labor employed in the oil fields are foreign born. It is apparent then that we have placed the very heart of American industry in the hands of men who are born in other lands, a small percentage of whom are naturalized and a large percentage of whom are illiterate and subject to the insidious propaganda that has been carried on so extensively in this country. The mining industry has not been organized to combat it.

W. A. GRIEVES

Chairman, Industrial Relations Division, American Mining Congress, whose twenty years' study of this subject qualifies him as an authority.

The great factor for industrial unrest in the mining industry is ignorance. The correspondingly great obligation of the employer of mine labor, therefore, is the education of his foreign employes to an understanding of the fundamental principles of the American constitutional government. It is vitally important that the people as a whole be given a true appreciation of the inter-dependency of capital and labor.

Public is Interested

The working conditions of mine labor have been painted in very black letters. The public is interested in knowing the real facts. The industrial life of the United States is dependent in no small measure upon the products of the mines.

It has been stated that someone must do a lot of good hard work in educating both management and co-worker in the simple fundamentals—and the fundamental of the fundamentals is "industrial cooperation is good business." When the dissatisfaction of the employe can manifest itself in such atrocities as the Herrin massacre, it is certainly time that the thinking people of the United States demand a thorough investigation of existing conditions, and it is certainly time that the mining industry as a whole unite to present to the people of the United States the true facts concerning the working conditions of mine laborers.

There is a general misconception of the meaning of the word "welfare.' Webster defines it as "the enjoyment of common blessings," "well-being," "prosperity." The word "welfare" is almost indiscriminately confused with the word "paternalism." These two words are in no way synonymous. Paternalism is the father of the "something-for-nothing" spirit. It is the very foundation of I. W. W.ism, and there can be nothing more detrimental to the worker. Paternalism has no place in a platform for industrial cooperation.

The American Mining Congress is vitally interested in bringing about better relations in the mining industry, and with that in view, is creating within its organization a department to be known as the Division of Industrial Cooperation. This Division proposes to start upon the assumption that industrial relations is not something to be considered in a remedial way. Welfare of the worker is as inherently a part of the day's work as any other factor in modern production methods and must be so regarded. Industrial cooperation between employer and employed is good business. It should be recognized as such by both.

It is not the purpose of the American Mining Congress to make recommendations or to advise the adoption of any specific form of welfare or system of industrial relations. The Division of Industrial Cooperation does propose to corre-

late the facts and give to the public a reliable report of conditions as they exist today in every branch of the mining industry. It proposes to let these facts speak for themselves.

Plan to be Presented

The plan for the organization of the Division of Industrial Cooperation will be presented to the Cleveland Convention, which will celebrate twenty-five years of growth in the mining industry and twenty-five years of service of the American Mining Congress. This organization has been for twenty-five years the clearing-house for mining troubles; the common working ground for all branches of the mining industry. It will make a survey of various forms of so-called welfare obtaining in both the metal and coal industries and will disseminate the information to the public generally. It has been planned to divide the work into two sections—metal and coal, these sections to be divided geographically, appointing sectional members in both the coal and metal states, each doing practically the same work, but enabling it to cover the whole United States in a comparatively short time. The work of these sections will be the collecting of data relative to the various welfare systems in existence in the mining states through correspondence with various mining companies. It is also planned to investigate the feasibility of such plans as have been proposed for the mining industry which are known as the "House and Senate" plan, the "Mitten cooperative plan" and similar movements. There will also be formed a general publicity committee, which will give to the press of the country full information concerning the work which mining companies are doing, not with an idea of exploiting the work of any one company or group of companies, but with an idea of disseminating general information concerning the living and working conditions of those who are employed in the industry. A large number of mining companies, both metal and coal, have given considerable study to this subject, and have, in their original ways, adjusted the workers' problem in the most satisfactory manner. They have been able to handle unusual situations in a unique way which may be of considerable importance to those companies who have not successfully solved their particular problem.

The American Mining Congress must have the full cooperation of the entire mining industry in this effort, and, when the facts are presented to the intelligent American public, there can be no doubt as to their judgment of an industry that is of such vital importance to the common welfare of the American people as mining.

REPORT OF THE NEW MEXICO CHAPTER

WITH THE OPENING of the Chino Copper Company mines after a period of inactivity of about a year, one can safely say that the mining industry in New Mexico is again on the up-grade and the period of depression has passed. Although the companies are slowly getting under way to production, the progress is nevertheless sure. Chino is now operating seven shovels at its mines and keeping four units in the mill at Hurley busy in concentrating the ores for shipment.

The Hanover-Bessemer Iron & Copper Company, with mines at Fierro, New Mexico, has resumed operations in the past few months and is making regular shipments of ore to the Colorado Fuel & Iron Company Works at Pueblo.

Most Encouraging Sign

Perhaps the most encouraging sign of the resumption of mining activity in this section is the acquisition by G. P. Goodier and his associates of working contracts upon the holdings of the late C. Amory Stephens, near Silver City, and at the present time they are mining and shipping from six to eight cars of manganese a day to Pueblo. They are also operating a group of mines known as the Houston-Thomas Group.

The 85 Mining Company continued operations throughout the depression and is now preparing to open up on a larger scale. The ores from the 85 go to the Calumet & Arizona Smelter, at Douglas, Arizona.

The Volcano Mine near Steins, New Mexico, is still in the process of development and its promoters state they have well-founded hopes of developing a permanent producer in this property.

The Hecla-Divide Company is continuing its tunnel operations by which it is expecting to develop large bodies of ore in the Pinos Altos District, a famous gold and silver camp of the early days.

The New Mexico coal fields have not suffered from the strike troubles as badly as many of the bituminous fields in the eastern states and have never entirely closed their mines.

As the New Mexico Chapter, the youngest of the state chapters of the American Mining Congress, approaches its second birthday, the organizers and members feel that the dangerous period of its existence has passed and that the organization has induced a closer cooperation of the mining interests in the state as well as clearer insight into the national problems that confront the mining industry at large.

Birth of the Chapter

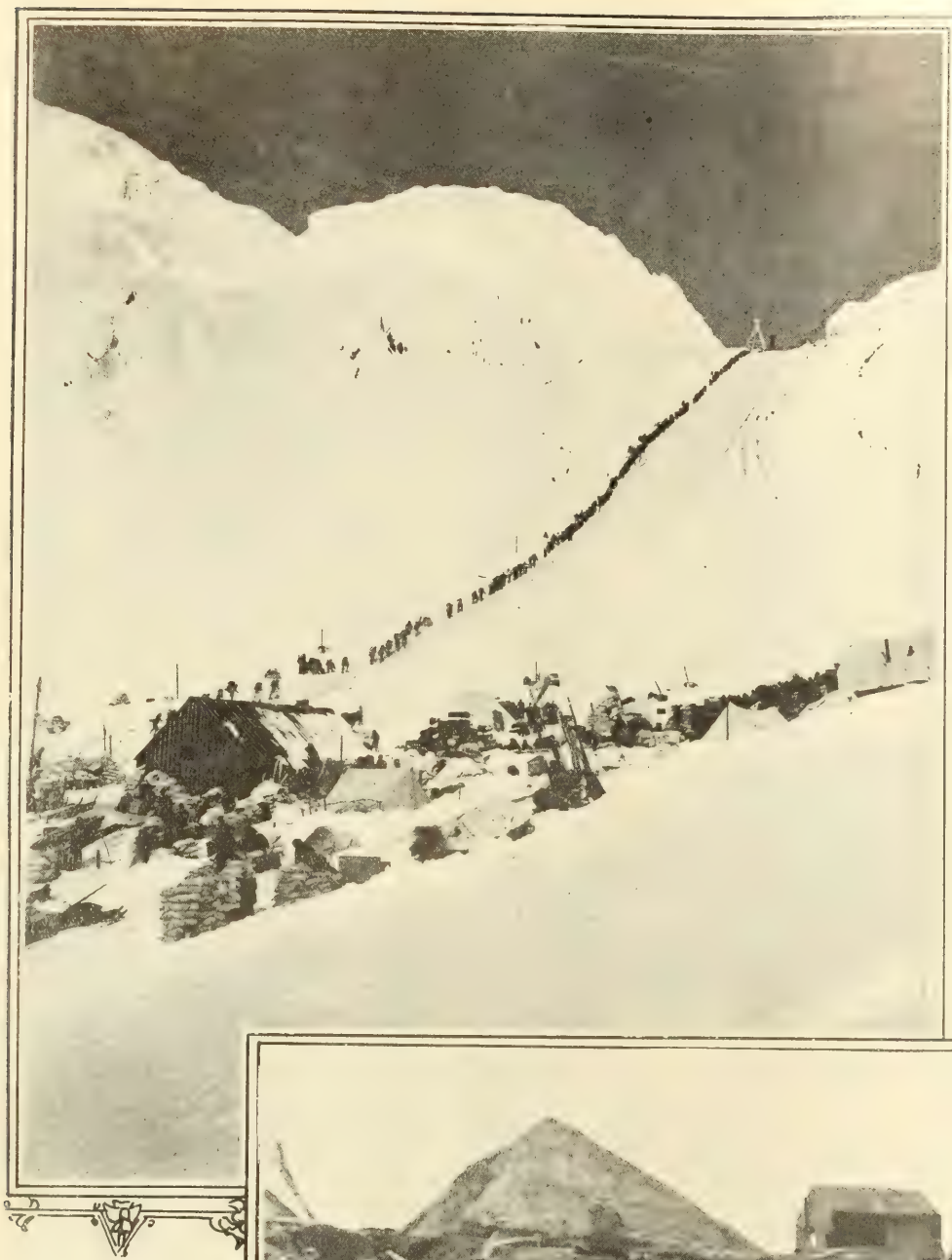
The chapter came into being on October 4, 1920, at Silver City, New Mexico, as the outcome of the determination of some fifty or more mining men that New Mexico should not lag behind other western states in the development of the practically untouched mineral resources within her borders. Mr. C. T. Brown, of Socorro, was the first governor. He, with the aid of the executive committee and board of directors, together with Mr. Burton Bunch as secretary—Mr. Bunch is now the western secretary of the National Organization, having resigned from the secretaryship of the New Mexico Chapter July 15, 1922, to accept this position—cemented the mining interests in the state together so that they presented a solid front in all state matters and legislation concerning the industry, which alone, if nothing else were accomplished, justifies the action of the organizers. The chapter, through its representatives, rendered material assistance to the taxing authorities in the construction and application of the troublesome features of the recently enacted tax code of the state.

John M. Sully, general manager of the Chino Copper Company, with mines at Santa Rita, and mill at Hurley, New Mexico, is the present governor. The chapter is indeed fortunate in having a man of Mr. Sully's ability at its head, particularly during the most discouraging period the mining industry has ever experienced. Mr. Sully has been engaged in mining in New Mexico for many years and has been in active charge of the operations of the Chino Copper Company since its incorporation in 1907. The success of this company is due, in no small measure, to Mr. Sully's ability and farsighted judgment. He has faith in the state chapter and national organization and under his direction the chapter will always be in the forefront in promoting the best interests of the mining industry in New Mexico. He is also the New Mexico representative appointed on the Board of Governors of the Western Division.

J. F. Woodbury, of Silver City, is the present secretary of the chapter, having succeeded Mr. Bunch July 15, 1922.

Opportunities are Anticipated

With the gradual resumption of mining activity throughout the west the chapter looks forward with eagerness to the opportunities which will come to render the mining interests, both small and large, assistance in solving their problems, fighting their battles and the fulfilling more and more of the purposes for which it was created.



ALASKA'S ARGONAUTS

Fickle Fortune sat just beyond Chilkoot Pass in 1898, doling out such portions as she saw fit to bestow upon each man in the long string of gold seekers who followed the lure of the Klondike as they "mushed" their way over the Dyea Trail. Taking the trail at the head of Dyea inlet, these venturous souls swung over the summit to Lake Linderman, and on across Lake Bennet and Lake Tagish to the Yukon River, the eventual destination being Dawson.

Two miners operating a "long tom" on the tundra at Nome in 1900.

Photos by courtesy of Seattle Chamber of Commerce.

ALASKA MAKES NEW START IN LIFE

With the Frenzy of the Bonanza Days Deeply Buried in the Past, the Territory has Begun to Build so That What is Gained Will be a Lasting Asset—Successful Mineral Development Now Dependent Upon Large-Scale Production

By Edward B. Swanson

ALASKA HAS FELT the feverish excitement of booming, fortune-making placers and has seen it dwindle away. Creeks whose names will live in romantic memory are scarred with heaps of gravel from which the gold has been garnered. Weather-beaten towns like Cleary and Chatanika, once filled with eager men, are now collections of ghostly buildings, to which have come and gone the men who wanted the gold and got it.

Alaska itself might be compared to one of these red-blooded hunters for gold. Passing through a night of orgy, drunk with success, he awakens to find that the night has robbed him of his easily-won fortune. With only memories and a headache remaining, he proceeds to build his fortune again, but on firmer foundation and with the experience of the night to guide him. So, Alaska has passed through an orgy of bonanza placers and has awakened to find that millions are no longer easily won from her creek beds; that some have taken their gold and gone; that it must build again.

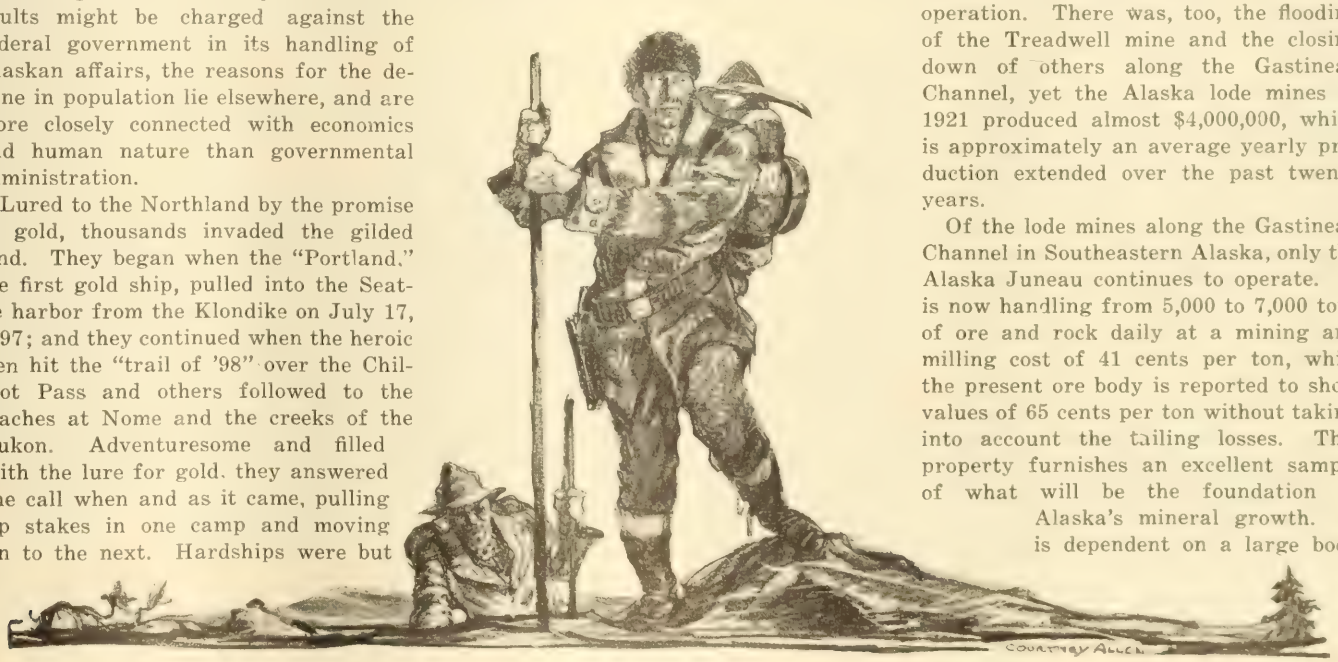
The Decrease of Population

During the past few years, attention repeatedly has been called to the decrease of population in the Northern Territory. It has been claimed that a maze of red tape and complicated governmental organization have threatened to strangle the territory. Whatever faults might be charged against the federal government in its handling of Alaskan affairs, the reasons for the decline in population lie elsewhere, and are more closely connected with economics and human nature than governmental administration.

Lured to the Northland by the promise of gold, thousands invaded the gilded land. They began when the "Portland," the first gold ship, pulled into the Seattle harbor from the Klondike on July 17, 1897; and they continued when the heroic men hit the "trail of '98" over the Chilkoot Pass and others followed to the beaches at Nome and the creeks of the Yukon. Adventuresome and filled with the lure for gold, they answered the call when and as it came, pulling up stakes in one camp and moving on to the next. Hardships were but part of the daily routine. Travel was by river steamers in the summer and by dog team and sled in the winter months. Supplies were costly, because, in addition to high freight charges, the merchants were compelled to order at the close of one season all the supplies for the next and the overhead of an entire year had to be charged against one turnover. Because of this, only the richest ground could be worked and little thought was given to the condition in which the ground was left. The idea was to get the gold. The bonanzas began to play out. For a time, others were discovered to take their places. When there were no more bonanzas, camps began to be deserted. Then the war came, taking its toll of young men from Alaska and imposing higher costs on those who remained. It was almost like hitting a man who was down. Booms and bonanzas do not make a firm foundation on which to build and when the booms and bonanzas were gone men as well began to leave.

In Dawn of New Day

But this is only half of the story. It is the story of the night. Alaska is young and full of strength. It is now in the morning of another day. Alaska has begun again to build, but looking this time to the permanency of operation; building so that what is gained will be a lasting asset.



Alaska leaped into the limelight with the gold rush to the Seward Peninsula in 1898. From a production of $15,000 in 1897, this section increased its production annually until it reached $4,800,000 in 1905, when it was joined by the discoveries on the Yukon. The Yukon Basin had been producing gold in small amounts since 1883, but jumped its production from $1,300,000 in 1904 to $6,900,000 in 1905, when discoveries were made on Cleary, Fairbanks, Pedro and other creeks. Both sections joined in 1906 to give Alaska its largest annual production of gold, $22,036,794, with the Yukon country furnishing $10,750,000 and the Seward Peninsula $7,500,000. Then the decline began. Lack of water for sluicing and hydraulicking was given at the time as one reason for the decline and a come-back confidently was promised but the decline continued until Alaska in 1921 produced only $8,073,540 in gold, an amount which is about evenly divided between gold derived from placers and that recovered from lode operations.

Lode Mining On Even Keel

During the period of placer frenzy, lode mining continued along a relatively even keel. It reached a production of $6,000,000 in 1915 and 1916 and then dropped off as a result of high costs of operations and scarcity of labor which, with a fixed price for gold, made it impossible for many properties to continue operation. There was, too, the flooding of the Treadwell mine and the closing down of others along the Gastineau Channel, yet the Alaska lode mines in 1921 produced almost $4,000,000, which is approximately an average yearly production extended over the past twenty years.

Of the lode mines along the Gastineau Channel in Southeastern Alaska, only the Alaska Juneau continues to operate. It is now handling from 5,000 to 7,000 tons of ore and rock daily at a mining and milling cost of 41 cents per ton, while the present ore body is reported to show values of 65 cents per ton without taking into account the tailing losses. This property furnishes an excellent sample of what will be the foundation of Alaska's mineral growth. It is dependent on a large body

of low-grade ore. Efficient mine management, with close attention paid to costs, has made it possible to mine this low-grade ore at a profit. Development work in the ore body indicates that it will add its quota to Alaska's mineral production for many years to come.

PROSPECTING HEAVILY HANDICAPPED

Prospecting in this part of Alaska has been rendered difficult and almost impossible by the dense underbrush and thick moss which conceals the formations. As the rock is laid bare, similar bodies of low-grade ore may be discovered and the methods developed by the Alaska Juneau in handling such properties will be applicable to the working of the new ore bodies.

Discovery of the Chichagoff lode in 1905 brought a return of prospectors to the Sitka district which, in 1871 was the scene of the first lode-gold mining venture in Alaska. The Chichagoff mine is now the largest producer of Alaska's lode-gold mines. Several small properties are also being developed in the Willow Creek district, adjacent to the government's Alaska Railroad, and in the country surrounding Fairbanks.

The United States Geological Survey, in its report on the Alaska mineral industry for 1920, states that the value of gold recovered from placers has dropped from $3.74 per cubic yard in 1908 to $1.13 in 1920. This decline has been caused by the elimination of bonanza deposits; increased use of dredges in gravels of lower value and a gradual decrease of value in the ground worked by other methods. The recovery through dredges during the past ten years has not varied far from the average of 61 cents per cubic yard, while the recovery through placer mining other than dredging has dropped from $3.36 in 1911 to $1.52 in 1920. Twelve percent of the gold recovered from placers in 1911 was produced by dredges; in 1921 this production had risen to 35 percent. The trend in placer mining is towards the working of low-grade gravels by dredging.

It has been estimated by a committee of Fairbanks mining men that the dredging around on the creeks immediately tributary to Fairbanks includes a total of 218,000,000 cubic yards. This must be taken as an approximation only, but suggests the amount of gravel open to prospecting. During the past summer, California interests were engaged in drilling test holes along some of the creeks in this district, and, if the results of these investigations reveal that dredging will be profitable, others probably will be attracted.

THE TREASURE SHIP FROM THE NORTH

On July 17, 1897, the S. S. Portland arrived from the Klondike at Seattle with her load of gold. It was the news of her arrival that resulted in the gold stampede which carried thousands of miners and adventurers on its crest. The above picture shows the Portland arriving in Elliott Bay with her load of gold twenty-five years ago

By the beginning of the 1923 season, it is expected that the bridge across the Tanana River at Nenana will have been completed and the road standard-gauged from Nenana to Fairbanks, making conditions especially favorable for the working of low-grade gravels and the development of lode properties in the Fairbanks District. Fairbanks will be within a two day's reach of Seward by rail; supplies will be available at all seasons of the year and labor should be more plentiful as accessibility is increased. In addition, the development of the Nenana coal field will make it possible to land a good grade of sub-bituminous coal in Fairbanks for an approximate price of $6 per ton.

Copper is second in importance to gold among Alaska's mineral resources. The first attempt at copper mining was made in 1881, when a few thousand pounds of this metal were produced from deposits on Prince of Wales Island. Systematic development of copper deposits began on Prince William Sound and on Prince of Wales Island in 1905. The Geological Survey reports a production of 119,854,839 pounds of copper in 1916, the banner year for Alaska's copper operations. Since then, with the exception of 1920, there has been a continued decrease in production. In 1921, the Survey reports, there was a production of 56,214,000 pounds. All of this production came from the three large mines of the Kennecott group—the Bonanza, Jumbo and Mother Lode—in the Chitina Basin; the Beatson Bonanza, on Prince William Sound; and the Rush and Brown mine, in the Ketchikan district.

Alaskan coals of a grade sufficiently high to compete in outside markets lie in badly-faulted fields, where mining costs would be prohibitive; while the coal which can be mined cheaply enough to stand the cost of transportation is of a grade too low to enter into competition. There is plenty of coal in Alaska, though, to supply all local needs.

In pioneer countries, the first exports are those which can stand high transportation costs. In Alaska, this was gold. As transportation developed, commodities of less unit value could be handled. Roads are being built in Alaska and the field is opening for the lower grade ores and minerals of less unit value, such as the lead-zinc-silver ores reported in the Kantishna country. The more freight handled, the less is the cost per ton and further development becomes possible. This is the cycle through which Alaska now is passing and, be it said in her favor, she remembers the night of bonanzas and is building this time on a firmer foundation.

GOLD PRODUCED IN ALASKA*

Year	Total Value	Lode Mines	Placers: Dredge	Placers: Other Methods	Copper Ores
1898.....	2,517,000	1,837,000	.....	680,000	.....
1899.....	5,602,000	2,092,000	.....	3,510,000	.....
1900.....	8,166,000	2,536,000	.....	5,630,000	.....
1901.....	6,932,700	1,942,700	.....	4,990,000	.....
1902.....	8,283,400	2,393,400	.....	5,890,000	.....
1903.....	8,683,600	2,737,533	20,000	5,926,067	.....
1904.....	9,160,458	3,050,977	25,000	6,084,481	.....
1905.....	15,630,000	3,506,000	40,000	12,084,000	.....
1906.....	22,036,794	3,348,943	120,000	18,487,000	80,851
1907.....	19,349,743	2,778,743	250,000	16,241,000	80,000
1908.....	19,292,818	3,357,335	171,000	15,686,483	78,000
1909.....	20,411,716	4,107,363	425,000	15,846,100	33,253
1910.....	16,126,749	4,105,459	890,000	11,094,806	36,484
1911.....	16,853,256	4,226,687	1,500,000	11,040,000	86,569
1912.....	17,145,951	5,002,399	2,200,000	9,790,000	153,552
1913.....	15,626,813	4,814,813	2,200,000	8,480,000	132,000
1914.....	15,764,259	4,863,028	2,350,000	8,380,000	171,231
1915.....	16,702,144	6,069,023	2,330,000	8,150,000	153,121
1916.....	17,241,713	5,912,736	2,679,000	8,461,000	188,977
1917.....	14,657,353	4,578,930	2,500,000	7,310,000	268,423
1918.....	9,480,952	3,473,317	1,425,000	4,475,000	107,635
1919.....	9,426,032	4,392,237	1,360,000	3,610,000	63,795
1920.....	8,365,560	4,473,687	1,129,932	2,743,068	18,873
1921.....	8,073,540	3,835,851	1,500,000	2,726,000	11,689
	$311,530,551	$89,436,161	$23,114,932	$197,315,005	$1,664,453

Compiled from Reports of U. S. Geological Survey.

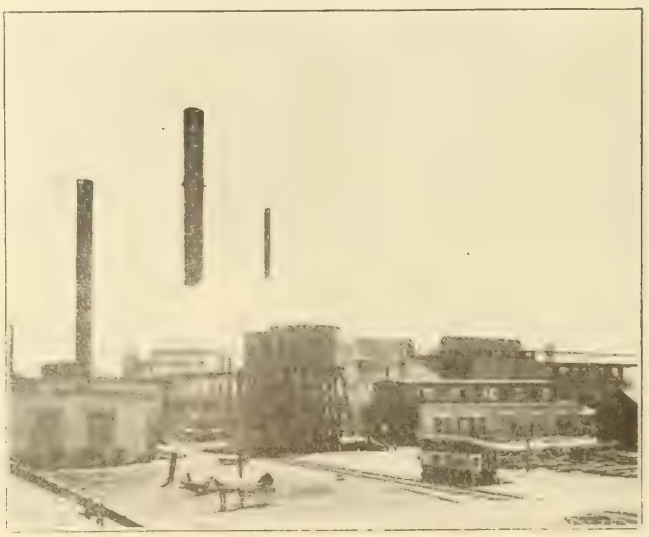
VIEW OF GOLDEN, COLORADO,
Once the State Capital, as it appeared in 1874.

GENERAL GRANT (FIFTH FROM LEFT) AND PARTY
Photographed during a visit to the Consolidated Virginia-California, Virginia City, Nevada.
(Photo by courtesy of Wm. J. Loring)

THE LEE MOUNTAIN MINE, NEAR REMINI, MONT.,
Camp which produced $10,000,000 worth of ore and was named by two miners after they had been greatly impressed by seeing Lawrence Barrett play in "Francesca da Remini" at Helena.

THE OLD MINING CAMP OF MERCUR, UTAH,
Showing in the background the famous Golden Gate mill. The camp, now abandoned, is always associated with the development of the cyanide treatment to recover gold.

HISTORIC PICTURE OF HELENA MONTANA,
Taken in the spring of 1865.



THE OLD HIGHLAND BOY SMELTER AT MURRAY, UTAH.
This plant, built in the '90's, was dismantled in 1909.

COAL'S PASSAGE UNDER

By George H. Cushing

COAL'S RESISTANCE to political advances—always rather feeble—has finally broken down. Coal, therefore, is passing surely and swiftly under federal control.

If this development were a mere act of punishment for coal's misdeeds, or if the punishment fit the crime, it could be dismissed lightly. But coal is the first of a long line of commodities to travel that same route because it is contended that to control coal is to conserve the public welfare and because that principle being established the practice must run in many directions. The upshot of it all, therefore, is that soon the federal government must be responsible for practices and prices in many directions. This is such a sweeping departure that success in controlling coal will mean the end of the American Republic and the beginning of the American Empire. Because this means so much, we may well spend a few moments to examine the forces which were at play to produce this great result.

The Death of a Nation's Ideal

Attention to this discussion is invited on this basis: The death of an individual is an every-day occurrence, but it has so engrossed the attention of the human race that we have studied and know the causes, the symptoms of approach and, so far as possible, the swiftly-changing emotions at the exact moment of dissolution. But, the death of a nation or of a great nation's ideal is quite rare. Not one man in a hundred million ever lives through that experience. We, who are now in the midst of this great event, can surely devote a half-hour to a consideration of its phenomena, and, like scientists, watch the swiftly-changing emotions as the old, lovely republic dies and as the new, undesired and unwelcomed empire rises in its place.

While coal plays a conspicuous part in the final scenes of the drama, it is obvious that the action began long before coal ever was considered as a vital force in our national life. It began, in fact, when Congress began to abdicate as the representative force of the whole people and transferred a portion of its power and discretion to the Interstate Commerce Commission. The action moved along swiftly toward the present climax with the appointment of each additional separate commission, clothed with congressional power and discretion. It grew even more rapidly when the states surrendered or lost their direct representation in Congress by appointing and controlling the Senate. That is, the states lost their voice in federal government—and the empire began to take definite form—when senators were elected by direct vote of the people. The movement gathered furious momentum when the Supreme Court abdicated as the final power—when it refused further to pass upon the wisdom of a congressional act and sat only to see whether the laws were properly written. The whole movement came to a climax when, under the guise of seeking the popular "welfare"—the specious pretext of every autocrat who ever usurped power—the government was ripped loose from its position as the administrator of justice and was, by assuming responsibility for coal, plunged into the administration of a multitude of private businesses.

Trend Known for Years

The major steps are known to every student of history and of government. The trend toward the most recent and most amazing overture has been known for years. The methods of procedure may not have been so carefully charted and so thoroughly understood.

When the railroads were about to be put under federal control, they had, as a preliminary, to be condemned before the bar of public opinion. Accordingly, the politicians and their affiliated publicists indulged in months and years of abuse—all directed to a particular point—preceding every new act of governmental aggression. The same thing happened to "Wall Street" when the money power of the nation was about to be taken from the hands of private bankers and turned over to the Federal Reserve Board, an arm of the new empire. The same thing, precisely, happened to the "packers" when control over their great plants was to be wrested from private hands and turned over to the new commission in the Department of Agriculture. And the same thing recently has been happening to coal. Only recently, the assault upon the coal industry was so furious and the efforts to destroy its good name before the bar of public opinion were so malignant that its advocates were generally stigmatized on the floor of Congress as "lobbyists," and, in four known cases, were sought to be removed from Washington by force of administrative pressure.

A Master Means of Destruction

With these incidents still fresh in memory, it will amuse you to take down your Dumas and read again the last of the Guardsman series—Vicomte de Bragelonne. That vivacious volume tells how Louis XIV, rising to the point where he proclaimed L'etat c'est moi, tore down one power after another until all the forces which had built the nation were under his heel. And he did it by adopting precisely the same tactics as were employed by our modern politicians who have destroyed one business force after another—by first starting a scandal against them.

Without the slightest conception of what it was doing, coal blundered upon this interesting stage and attracted attention to itself by issuing a wail of lament. It was, it complained, giving to the nation its great industrial development because our industry had the benefit of the cheapest power on earth. But the real author of this national wealth—the coal industry—was itself impoverished. It created wealth for the nation and for others, but its own reward was poverty, impending bankruptcy and demoralization. It had, it complained, no leaders to direct its course out of bondage because it had no rewards to offer which would attract leaders. It was coal's plea of poverty which attracted attention to it. And it was the politician who discovered the prince underneath the rags of the beggar.

The potentialities of coal being discovered, the next thing to do was to create the popular demand that coal be brought under control. Thus the old and familiar device—a campaign of abuse—was brought into play. The opportunities for starting a coal scandal have been sufficiently numerous for all practical purposes in the last five years. First, we had a war, during which we had a federal fuel administrator, who gave us a fuel famine. When the war was over the fuel administrator went back to his college retirement, leaving the coal industry to bear alone the load of shame of not having supplied the nation with coal during a world war. Secondly, in 1920, we had a break-down of transportation, due to a strike and the disarrangement incident to a complete change of managers. During the reconstruction period we had excited pronouncements to the public that a fuel famine was impending. When the people became panicky, prices rose. Then the railroads recovered—as everyone knew they would—and the criers of famine retired into seclusion. But, although the fault was that of others, the coal trade remained in the open to bear the shame of having profiteered. Thirdly, in April, this year, the miners' union went on a strike and shut off the nation's coal supply for five months. Prices started to rise again. Before there was an acute shortage, the miners went back underground; the fuel controllers folded their

hands piously over their breasts and retired to the seclusion of the cabinet; and, the coal industry was left to stand alone before the Congress of the United States with the shameful accusation against it that it had deprived a people of their coal.

How Power Has Been Sought

The true student knows that coal created none of these situations and that it was powerless to correct them. He knows, too, that invariably power over the industry, because of these extraordinary situations, has been sought by the wilful misrepresentation of the facts or by a most adroit concealment of the essentials, while other and false considerations were advanced.

Going deeper, the real student knows that federal control over any industry was gained through false representations to the people. In the case of the railroads, for example, the real accusations against them were that some few financiers had misrepresented their true value when issuing capital stock and that some railway managers gave preference to big shippers over small shippers when quoting rates. The real student knows that the proper cure would have been to make those things penal offenses and then to have arranged to punish the offenders. Instead, they were employed as the pretext to seize the rate-making power, which bore no direct relationship to either offense, but did bear a very close relationship to the desire to expand the federal power.

The Real Accusation

In the case of coal—to skip all of the others—the real accusation against the industry is that it has obeyed the Sherman anti-trust law too literally. That law enjoins competition upon every industry. Coal has competed so violently that we have what is now called "wasteful over-development."

On the other hand, the miners' union has not obeyed the Sherman anti-trust law at all. Its officials have declared openly that they despise that law, and have paid no attention to it. The law makes it as much of an offense to "try to monopolize" as it is to monopolize an industry. In the face of that prohibition, the miners' union has boldly written into its constitution that its first and big objective is to gain a monopoly of labor in and around the coal mines on the "North American continent."

Today, because an industry which competes too much is involved in a strike of its employes, who do not compete at all, and because the labor monopoly has closed the coal mines for five months, Congress is going to take over control of the coal industry. It is perfectly obvious that the choice of a corrective is wilful and capricious, bearing no direct relationship to the disorder.

The cure, if applied directly to the seat of the disease, would have been to have left the coal industry alone in its religious adherence to the Sherman act and to have struck down the union which was defying the government to enforce that law. And that is what would have been done if the old spirit of the old republic had survived. It was because the spirit of the republic was passing that another course of action was chosen.

At this point, the disposition of the casual observer would be to say that, since the arrogant labor union is thus

GEORGE H. CUSHING

left at liberty and free to control things, we are rushing headlong into a second Russia in the 20th century rather than back into a duplication of the experience of France under Louis XIV. He must be a careless observer if he believes that. A close scrutiny will disclose that labor is about to be crushed also.

Movement Well Under Way

Indeed, the force which must be crushed before the empire can really succeed the republic is the labor union. And the movement to bring it into subjection is well under way. For instance, the railroad shopmen went on a strike on July 1. They tied up only small parts of the railroad equipment. Except in minor particulars, they never really interrupted service. As a strike, the thing has been a farce. Its effect has really existed only in the headlines of the newspapers. But it is going to prove the most expensive strike that labor ever called, because it offers the excuse for the full control of labor. The Railway Labor Board—one of the strong arms of the American Empire—will rise out of this strike supreme over the affairs of the railway workers.

And, to match it precisely, the Coal Commission will rise in the coal fields supreme over the affairs of the coal miners.

Thus one by one the great forces in the nation are marched past the Congress to be surveyed by those hurried and superficial gentlemen. And, every few days, the babble of words is stopped on "The Hill" long enough to allow some law to strike down a great force in the nation. As it falls it is robbed of its independence. And, whenever one of the great forces falls, a new root of empire sprouts in its welter.

The spirit of empire always is ruthless; we need not marvel at any of its expressions. But the American people always have been true sports, with an eminent sense of fair play. I have wondered, for long, at their complacent indifference to all this misrepresentation of their affairs for the all too obvious purpose of gaining political control of things. Only recently a thing occurred which ravished the American sense of justice. The strike had, of course, involved the anthracite as well as the bituminous mines. Anthracite is the household fuel of a great part of our population. It was, above everything, essential that these mines should be put back to work at the earliest possible moment.

The call was made by the highest officers in our government to the hearts of the anthracite operators. They were urged to yield every technicality that peace might be restored. They were implored to consider first the plight of the people who would have no coal in winter. Those operators heard the call and responded. For days and weeks, when it seemed impossible to break through the iron mask of the power-mad leaders of the miners, these operators stuck to only one job—that of getting the strike settled.

Opened Wide the Door

When, to end the strike, the President proposed that the old wage scale be paid until a commission which he would appoint could arbitrate, they were the first to assent without the suggestion of a drawback. When this first effort failing the Senate sent two of its best members to sit with the conferees while further negotiations were in progress, the operators opened the door wide to and welcomed the Senate's representatives.

But, while that industry's greatest and strongest men were thus yielding to the slightest wish of their government, the very men who were urging them on were taking advantage of their enforced absence from Washington to rush through laws which must forever rob them of their business freedom. And the laws which commit that robbery were passed before the contract with the miners was drawn up and signed, and hence before a single strong man in the

entire field was free to defend his industry.

As I have said, the spirit of empire is shameless and ruthless. It never quibbles over methods. It is concerned only with the acquirements of its own ends. In past, it has not stooped to misrepresent, as in the case of the railroads. It has not hesitated, as in the case of control of the packers, at an unmoral evasion of the spirit of the Constitution so long as clever wording clove to the letter of that document. It has not hesitated, as in the case of coal, to leave the offender go free temporarily while it confiscated the property of the non-union mines, which alone kept the nation in fuel during the strike. Such things may be expected, because they spring from the very spirit of empire. But, what puzzles me is: What has happened to the spirit of fair play among the American people? To what distant part of nowhere has their sportsmanship departed?

But, whether we understand it all or do not understand anything about it; whether we can or cannot explain by mere words the power of a few over the many; or whether we can comprehend the indifference and compliance of the people, the fact remains that by these various things the American republic is dying, while the American empire is rising in its place. You and I are living in the intense period of transition. It is not a pleasant picture we see around us. But you must admit it is a wonderful picture.

THE HISTORY OF STANDARDIZATION IN MINING

STANDARDIZATION always has been a misapplied term. We have been noted nationally and internationally as a nation of standards. The Europeans frequently have criticized us, saying that we are willing to sacrifice our individuality for standardization. This has led to the popular conception of the term "standards"—and in general to the antipathy to it. To the average mind, standardization means houses built identically the same; the doing of this or that in a stereotyped, automatic manner. Used in its proper form, it means elimination of waste; simplification of methods; efficiency in operation.

The American Mining Congress and the words "safety," "efficiency" and "cooperation" long have been synonymous. This principle applies directly to its standardization work. Safety in operation, efficiency in milling and mining practice, and cooperation of all of those interested in these important factors in the success of the mining industry.

The Guiding Factor

One of the important reasons which led the American Mining Congress into the field of standardization was the necessity of eliminating the burden imposed upon mining companies through the request of government officials for the filing with various federal agencies, reports on practically every phase of mining. This condition has not yet been remedied, although constructive work is being done which will eventually remedy the situation. Out of the move to procure the standardization of the form of report required grew the present effort to standardize mining methods, practice and equipment.

The first really constructive effort along this line was the committee formed under the auspices of the American Mining Congress in 1911, for the purpose of standardizing electrical equipment in coal and metal mines. The committee made two or three reports to the annual conventions of this organization, under the subject "Standardization of Electrical Equipment." The industry, however, had not yet awakened to the importance of the work, nor felt the necessity for material reduction in production costs.

E. R. COOMBES
Secretary, Standardization Division,
American Mining Congress

Set of New Conditions

Following the World War, a new set of conditions arose. The metal industry found itself confronted with new problems, upon the solution and adjustment of which depended, in a large measure, its future welfare and prosperity. Coal operators were confronted with unprecedentedly high wage scales, and the cost of equipment in both metal and coal-mining fields had more than doubled. It was, therefore, necessary to make reductions in production costs. Agreements with the workers prohibited any material reduction in labor costs. Labor also was a big item in the cost of equipment—which meant that operators would not see a reduction in that field for many months.

The most promising field for cost-reduction appeared to be in the systematizing and standardizing of mining methods and practice and elimination of waste in every department by the installation of labor-saving machinery. Some of the larger companies employed experts along this line and devoted many months to a study of simplification of practices. These companies were highly successful in their efforts, and gradually there grew the demand, which created a general movement looking to the national standardization of mining methods, practice and equipment.

Various Committees Appointed

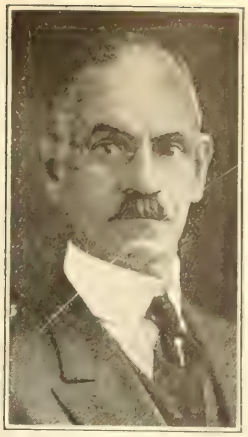
To meet this demand, various agencies appointed committees to investigate the possibilities of standardization. The Bureau of Mines increased its efforts, and published several very valuable pamphlets upon the subject. The Bureau of Standards took a more active interest in mining welfare. The American Institute of Mining and Metallurgical Engineers appointed a committee to study the subject. The American Engineering Standards Committee undertook to find sponsors for various mining standards. The National Safety Council made special recommendations in the standardization of mine safety signals and equipment.

All of these committees were, and are, doing excellent and constructive work, but with so many agencies covering the same field, there was unavoidable duplication and conflicting recommendations.

It was apparent that there should be some central agency which could and would coordinate these efforts and give to the mining industry, through one agency, the best thought of all.

The American Mining Congress seemed to be the logical agency for this coordination. It has for many years been the agency which has furnished a common working ground for all mining problems. It has attempted to be the "common denominator"—the impartial agency—where all may meet for the working out of problems of interest to mining. It

A. B. KISER



K. A. PAULY

C. E. WATTS

R. L. ADAMS

COL. W. R. ROBERTS
Chairman

C. D. KNIGHT

DR. H. M. PAYNE

E. N. ZERN

C. H. TRIK

Coal Mining Branch, Standardization Division

represents, primarily, the mine operator, whose approval must be gained before any definite policy can be formed in regard to standards or any other important subject, affecting the industry. It represents the manufacturer of mining machinery and equipment—who must make the machinery it is desired to standardize. Its membership includes large numbers of engineers—who must use the standardized equipment and who must approve the simplification of methods and practice. It is in constant touch with the government agencies that are doing a vast amount of research upon the subject of standardization. Its membership is interlocking with those national associations which have committees that are studying the problem.

An Obvious Necessity

When attention was called to the matter, the American Mining Congress saw the necessity and importance of the work, and at its St. Louis convention, in October, 1919, began preliminary organization by appointing a Coal Committee for the purpose of coordinating the efforts being made to standardize coal-mining equipment. Colonel Warren R. Roberts, president of Roberts & Schaefer Manufacturing Company at Chicago, was selected as the chairman of this committee.

The organization of all sections of this committee, as well as all other branches of the Standardization Division, is such as to give equal attention to interests of the mine operator, mining engineer, manufacturer of mine equipment and United States Government. The chairmen of the various sections are men peculiarly fitted for the appointment because of their special studies and practical experience in the standardization subject.

From its very inception the movement was a success. The rapid development of the Coal Committee and the outstanding recommendations made by it, led to a request from metal operators to form a similar committee for the metal industry.

At the 23rd annual convention of the American Mining Congress, held in Denver, in October, 1920, it was voted to form the Metals Committee, under the leadership of Mr. Charles A. Mitke, consulting engineer, Bisbee, Ariz., and to combine the work of the two committees into the Standardization Division.

Now Four Years Old

This division is now four years old. Its first report created wide interest, and its second report has attracted national and international attention. Six thousand copies of the second report have been printed and distributed.

In order that there would be no possible duplication of effort, the subject was presented to the American Engineering Standards Committee and its cooperation solicited. Dr. P. G. Agnew, secretary of this committee, readily agreed to assist, and, at the suggestion of the American Engineering Standards Committee, there was organized what is known as the "General Correlating Committee," of which Dr. E. A. Holbrook, assistant director of the United States Bureau of Mines, is chairman. The General Correlating Committee is composed of:

The U. S. Bureau of Mines.
The National Safety Council.
The American Institute of Mining and Metallurgical Engineers
American Institute of Electrical Engineers.
The Associated Companies.
The American Mining Congress.

Before any standard can be finally adopted, all of these agencies, including the American Engineering Standards Committee, must be in accord.

The accomplishments of the Standardization Division during the fourth year of its existence far surpass any of its former recommendations, and no mine operator who is interested in reducing his production costs, in installing the most practical, economic and efficient methods of handling his ores and in installing labor-saving equipment can afford to miss the Third National Standardization Conference, to be held at Cleveland, Ohio, October 9-14.

Special Invitations Issued

Special invitations will be issued to several departments of the United States Government, to all state governments interested in mining, to the mining departments of Canada, Mexico and other countries, and to our universities to send representatives to this Standardization Conference. Authorities on standardization, and on Safety and Efficiency from several national organizations and societies, and leading industrial corporations will be invited to participate in our program.

The program of the Third National Standardization Conference is arranged upon the theory that those who are interested in standardization are especially interested in the practical recommendations of the committee. The major portion of the time allotted to the conference will be devoted to discussion of committee reports, and their recommendations for standards.

The preliminary program includes addresses by

J. M. Wainwright, Assistant Secretary of War.
Hon. Charles G. Dawes, formerly Director of the Budget.
The Hon. Reed Smoot, U. S. Senator from Utah.
Dr. P. G. Agnew, Secretary, The American Engineers Standards Committee.
Dr. E. A. Holbrook, Assistant Director, U. S. Bureau of Mines.
Charles A. Mitke, National Chairman, Metal Mining Branch.
Col. Warren R. Roberts, National Chairman, Coal Mining Branch.

The Main Features

The main features of the conference include recommendations for Standards, and reports from committees upon the subjects of:

Drilling Machines and Drill Steel—Norman B. Braly, of the North Butte Mining Company.
Mining and Loading Equipment—E. N. Zern, of the Keystone Consolidated Publishing Co.
Mechanical Loading Underground—A. B. Kiser, of Pittsburgh Coal Co., and K. A. Pauly, of General Electric Co.
Mine Timbers — Gerald Sherman (metals), of the Phelps-Dodge Corporation, and R. L. Adams (coal), of the Old Ben Coal Corporation.
Metal Mine Accounting—T. O. McGrath, of Shattuck Arizona Mining Co.
Underground Transportation—Wm. B. Daly (metals), of Anaconda Copper Co., and C. E. Watts (coal), of Berwind-White Coal Mining Co.
Mine Ventilation—Charles A. Mitke (metals), Consulting Engineer, and C. H. Trik (coal), of Jeffrey Mfg. Co.
Fire Fighting Equipment—William Conibear, of the Cleveland Cliffs Iron Co.
Outside Coal-Handling Equipment—Dr. Henry Mace Payne, Consulting Engineer.
Steam Shovel Equipment—H. C. Goodrich, of Utah Copper Company.
Mine Drainage—E. D. Knight (coal), of Cabin Creek Cons. Coal Co., and W. H. Gallagher (metal), of Pickands, Mather & Co.
Methods of Mine Sampling—Philip Wilson, of Calumet & Arizona Copper Co.
Milling and Smelting Practice and Equipment—Forest Rutherford, Consulting Engineer.

Display of Equipment

More than 150 leading manufacturers of mining equipment will display their latest labor-saving, cost-reducing equipment, at the Public Hall, Cleveland, Ohio, during the 25th Anniversary Convention of the American Mining Congress, October 9-14, 1922, at which time, and in conjunction with which the Third National Standardization Conference will be held.

Operators will thus be given an excellent opportunity for observing practical demonstration of the Division's recommendations as well as listening to discussions by the industry's best informed men upon the subject of Standardization.

The Convention sessions and the Exposition of Mines and Mining Equipment will be held in one building, the beautiful new auditorium—the Public Hall—at Cleveland, Ohio. This feature will be of special advantage and importance to those who attend the Standardization Conference.

Thursday, October 12, is the National Standardization Day. There will be additional sessions of the Conference, but this one day is set aside by the convention management for special consideration of this subject.

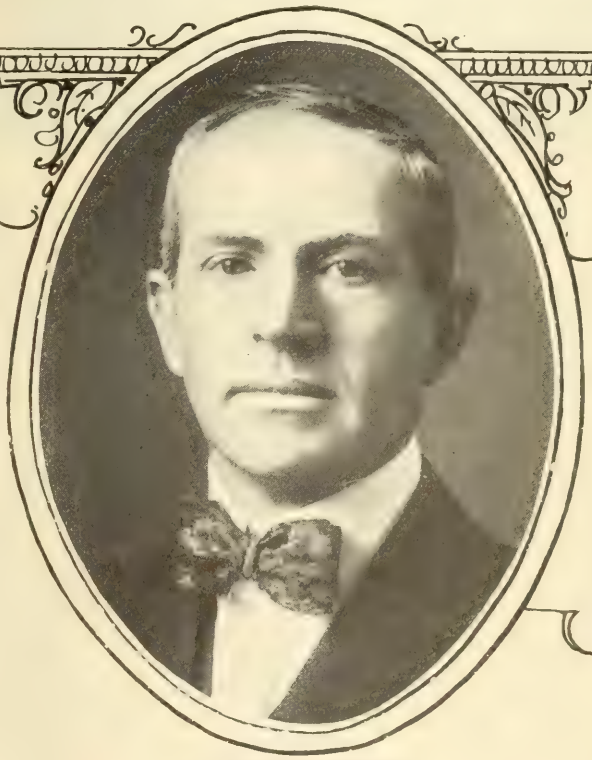
NORMAN B. BRALY

WM. DALY

WILLIAM CONNIBEAR

H. C. GOODRICH

GERALD SHERMAN



CHAS. A. MITKE
Chairman

FOREST RUTHERFORD

WM. GALLAGHER

PHILIP WILSON

LUCIEN EATON

T. O. McGRATH

Metal Mining Branch, Standardization Division

CLEVELAND AS THE CONVENTION CITY

CLEVELAND'S PUBLIC SQUARE

This scene is thoroughly typical of the city's industrial activity inspired by a notable civic pride

CLEVELAND, centrally located for all conventions, is particularly adapted as a meeting place for representatives of the mining industry.

As a matter of fact, the city has been built up largely by mining industries and its atmosphere reflects this influence. Practically the entire iron ore movement from the Lake Superior districts to the steel mills is controlled by companies with headquarters in Cleveland and, in addition, Cleveland is the headquarters for a number of the largest producers of both bituminous and anthracite coal. The extensive petroleum production is also centered in and about the city and many of Cleveland's most representative citizens are interested in the great copper developments on the Michigan peninsula. Limestone and other forms of quarrying operations round out the quota of mining activities which natural deposits and industrial resourcefulness have bestowed upon this district.

Wealth of Mine Products

The realization is not general that the value of mine production in the state of Ohio in 1920 amounted to $180,000,000, and that this immense total is supplemented by the value of iron ore shipped through Ohio lake ports.

Thus, mining being a basic industry and furnishing essential raw materials, has given to Cleveland great advantages as a manufacturing center. Its 4,000 manufacturing plants have an annual output exceeding $750,000,000 annually in products. This manufacturing output is remarkably diversified, including practically every form of manufacturing, and Cleveland leads the country in the production of wire, nails, bolts, screws, malleable castings and heavy machinery. Quite natural it is, then, that this city should furnish the ideal setting for a convention dedicated to industrial progress.

The City's Original Mould

The original mould in which Cleveland was cast was of the New England pattern. The lands in the northeastern corner of Ohio had been granted by the United States Government to Connecticut, after the Revolution in the settlement of claims made by the seaboard states to western territory, under old colonial grants. The state sold the larger part of its possessions in Ohio to a group of Connecticut men known as the Connecticut Land Company. In 1796 that corporation sent a party of surveyors headed by General Moses Cleveland to lay out a town site at the mouth of the Cuyahoga River. The embryo city was named after its chief founder.

After the usual hardships and discouragements of settlements in the wilderness, Cleveland began to gather headway about 1830, when its population still numbered 1,076. In 1836 the town was incorporated as a city and the census of 1840 showed that it contained over 6,000 residents. By 1850 the population was 17,000, and from that time the rise of Cleveland was very rapid. The period 1855 to 1860 saw the beginning of manufacturing in Cleveland. Prior to that time shipping and ship building were the principal business activities aside from wholesale and retail merchandising. Since 1860 Cleveland has risen from the rank of fortieth city in population in the United States to fifth city in 1920.

Cities possess individualities and each community creates a distinct impression quite its own upon those to whom it is presented in contrast. A large portion of Cleveland's strong "personality" is due to the remarkable civic pride which constantly has asserted itself and which has grown in bounds as progress has rewarded the concerted movements bringing to the city its industrial success.

Aggressive Civic Step

An aggressive civic step which has attracted world-wide attention to Cleveland is the Group Plan for public buildings. A "T" shaped tract of land approximating 104 acres in the heart of the city, and known as the "Mall," will ultimately contain all of Cleveland's municipal buildings. The Federal Building, costing $3,870,000, the Cuyahoga County Court House, costing $4,500,000, and the City Hall costing $3,330,000, are already occupied. Appropriations are outstanding for a public library and a Criminal Court building upon the "Mall." The completed project will represent an outlay in excess of $30,000,000.

Cleveland is famous as an educational center with Western Reserve University and the Case School of Applied Science.

Cleveland's hotels furnish the convention delegate with first-class accommodations at reasonable rates and hospitality is a noted feature of their services.

Humming with industrial activity; teeming with business enterprise and progressiveness; mindful always of maintaining its proud record of civic accomplishment; ever careful of the health, comfort and recreation of its people and every inhabitant a booster of his city—this is Cleveland.

1896 - 1921
A RÉSUMÉ OF TWENTY-FIVE YEARS IN MINING

By HENRY M. PAYNE

(Copyright, 1922, American Mining Congress.)

THE MINING PRODUCTION of the United States is derived principally from twenty-two separate industries, of which thirteen are classed as metallic and nine as non-metallic. In 1896, based upon the value of production, copper amounted to 27.7 percent of the mineral output of the nation, bituminous coal 20 percent, anthracite coal 13.2 percent, silver 10.3 percent, petroleum 9.8 percent, gold 8.8 percent, iron 3.2 percent, lead 2.5 percent, zinc 1.4 percent, and aluminum 0.2 percent. There remained barytes, chromite, graphite, nickel, pyrites and sulphur, whose total output amounted to only 0.3 percent.

Twenty-five years later, copper occupied fifth place, petroleum had risen to second place, while bituminous and anthracite coal, with petroleum combined, amounted to 86.2 percent of the value of the country's annual mineral production, or more than double their combined ratio in 1896. Magnesite, molybdenum, potash, tungsten and vanadium were added to the industries of appreciable value, so that at the close of the quarter century under observation, the relative rank in value of production was:

	Pct.		Pct.
Bituminous coal	43.9	Gold	1.8
Petroleum	28.5	Lead	1.5
Anthracite coal	13.8	Sulphur	1.1
Iron	3.4	Zinc	0.8
Copper	2.5	Aluminum	0.4
Silver	1.9	Vanadium	0.1

Barytes, chromite, graphite, magnesite, manganese, molybdenum, nickel, potash, pyrites and tungsten combined, amounted to 0.3 percent.

The history of these industries, their struggles and their evolution, their economic dependence upon varying factors in national government and international relations, their permanence or their precarious existence, their locational handicaps or facility of access, the inventions of mining machinery and the development of metallurgical processes, the utilization of by-products and the profitable recovery of low grade ores, culminating in an unprecedented supply of essential mineral commodities in time of war, constitutes the brightest chapter in the annals of American industry.

Of the men, from prospector to scientist, who have made this possible, space forbids individual mention. Of the many organizations and agencies through which it has been accomplished, the U. S. Geological Survey, the Bureau of Mines, The American Mining Congress, the American Institute of Mining and Metallurgical Engineers, and the Mining and Metallurgical Society of America, together with the other national engineering and technical societies, stand pre-eminent.

There have been numerous developments, originally indicated for one industry, which have been adapted to many, e. g., Flotation. While these will be discussed under some one industry, their use is not necessarily limited thereto. A series of graphs has been prepared by which the growth of each may be visualized throughout the quarter century.

BITUMINOUS COAL

THERE WERE certainly no inducements to enter the coal business in 1896. The average price at the mines was 83 cents per ton, and abnormal competition caused overproduction, which was absorbed principally in domestic trade and by transportation companies.

Pennsylvania produced 36 percent of the total, with Illinois second. There were 2,599 mines in operation, employing 237,665 men, who worked an average of 192 days per year. It will be seen therefore, that some conditions have not materially changed in the industry in 25 years!

In Days Gone By

One and one-quarter million tons of coal were imported to the Pacific Coast from Australia and British Columbia. New England secured the major portion of her soft coal from Nova Scotia, and about one and one-half millions tons were exported to Canada and to the West Indies, in the latter case Cuban iron ore furnishing a return cargo. Thirteen percent of the total output was machine mined.

There was considerable agitation for the development of the Warrior River in Alabama in order to furnish a bunkering port on the Gulf with Alabama coal. 1897 saw an increase of 10,000,000 tons in output with average values down to 81 cents a ton, the increased tonnage being largely due to the further increase in mining machines. The iron and steel industry was growing, the supply of natural gas was already showing signs of weakening, and a keen rivalry existed between Pennsylvania, West Virginia and Ohio, which served to keep up the general average of production notwithstanding a four months' strike in Pennsylvania, Ohio, Indiana, Illinois and West Virginia.

The following year average values dropped to 80 cents a ton. There was a great shortage in labor and car supply and for the first time in ten years the demand exceeded the supply. The average working year was 190 days.

Reference to the accompanying graph shows the remarkable and regular increase in production of bituminous coal over a long period of years. In 1899 the United States took the lead of the coal producing countries of the world. The increase over 1889 was 80 percent; over 1879, 280 percent; over 1869, 700 percent; while in the same time Great Britain had only doubled her production, which in 1869 was four times that of the United States.

The low price of coal and keen competition stimulated the use of mining machines, and attention was directed toward the necessity for mechanical loading machines. Consumption for colliery purposes was estimated at 1½ percent.

Continued competition brought about the consolidation of many small companies. 1900 was considered the most prosperous year in the industry up to that time. Exports amounted to about 2,000,000 tons. Twenty percent of the coal was machine mined. The only strike of importance was in Maryland, where the average time lost per man was 105 days. Wages were increased in 1901 and the average production per man per day fell from 3.04 to 2.94 tons. Efforts were made to make briquettes on a commercial scale but failed, due to cost and difficulties of manufacture.

Many New Mines Opened

The following year (1902) many new mines were opened, and the total number of men employed had risen to 370,056, while the average working year had lengthened to 230 days. The undercutting machine continued to grow in favor and in 1903 over 28 percent was machine

Bituminous Coal

mined coal. West Virginia increased her output by approximately 5,000,000 tons, and long wall mining was especially favored in Missouri. The rapid industrial development of the year consumed all the increase, and prices became slightly higher. Labor troubles in Alabama and Colorado over the 8-hour day, and a falling off in the iron trade in 1904 caused a decrease of 4,000,000 tons in the annual output. Serious car shortages occurred in West Virginia, many of the mines receiving cars only 2 to 3 days a week.

Effect of Strike Fear

Fear of a strike in the spring of 1906 caused extra output by the miners the preceding fall, with lower prices. The only serious labor trouble in 1905 was in Illinois due to the enactment of the Shot Firers' Law. Several strikes resulted and the matter was finally arbitrated by the chairman of the Anthracite Coal Commission.

Work was generally suspended from April to June, 1906. Notwithstanding the suspension, the total output for the year showed an increase, due to machine mined coal which was 35 percent of the total, averaging 11,000 tons per machine per year. The distribution of types of machine at this time was compressed air punchers, 57.9 percent; chain breast machines, 40.6 percent; long wall machines, 1.5 percent, the latter being used principally in Ohio and Missouri.

The wage agreement of 1906 covering a period of two years, the value of the unprecedented bituminous coal production for 1907 equalled in value the total mineral production of the United States ten years previous.

Fuel oil became a factor on the Pacific Coast, but general industrial conditions were excellent until October, with high wages, and both car and labor shortage. There were 11,144 mining machines in use, and the average production had risen to 12,381 tons each.

The amount of time lost from strikes was less than in any time for ten years. Four separate mine disasters added to the extremely high casualty list of the year. Pennsylvania, Illinois and West Virginia were the three principal producing states. Increasing demand for clean coal led to the installation of many washers and picking tables, hitherto a novelty in bituminous coal.

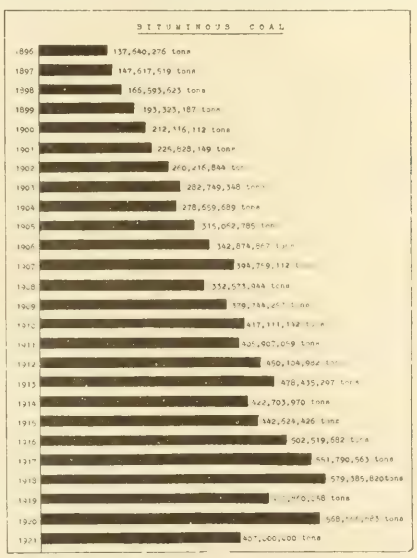
Although only nine years had elapsed since the United States passed Great Britain in coal production, competition no longer existed except in the export trade.

Mining Remained Active

Many contracts carried over into 1908. Consequently although there was a general depression, coal mining remained active. Agitation was continued for better preparation of coal, and the industry began to attract many new members who commenced to open up new areas and build railroads to serve them, stimulated by the growth of iron and steel, notwithstanding the fact that the mines already in operation could have furnished 50 to 75 percent more production.

The result was an already scanty supply of railroad cars diverted to a still greater number of mines, with miners continually migrating.

Briquetting of culm, slack, and lignite had attained such a measure of success abroad, that the increase in price of domestic coal led to systematic search for a suitable binder, and a number of experimental products reached the market, increasing in 1909 by 40 percent. Many extravagant claims of secret binders were made, and a large number of briquetting plants came into existence. The



U. S. Geological Survey paid special attention to this work on lignites. There was a marked shortage of labor in the east, but in the metal mining states of the west, smelter demand induced a healthy coal market.

A Striking Comparison

In 1910 the production of bituminous coal in Pennsylvania alone equalled the production of the United States in 1890. A 5½ months' strike in Illinois, Missouri, Kansas, Oklahoma and Arkansas was neutralized by this increased output elsewhere. Systematic efforts of the newly created Bureau of Mines to decrease "shooting on the solid" resulted in a gratifying decrease in accidents. This campaign was carried over into 1911, which was a year of depression in the iron and steel trades. Car supply improved, and the average price of coal at the mines was $1.11. Exports increased more than 3,000,000 tons.

By 1912 the 8-hour day was very generally observed. Alabama led in the quantity of coal washed, with Pennsylvania and Illinois next. In these three states over 80 percent of the product passed through a washer. The new wage scale increased the price of coal 4 cents a ton. Importations to the Pacific Coast and New England continued from Australia, British Columbia and Nova Scotia. Forty-one percent of the bituminous export shipments were from New York Harbor, and 31 percent from Hampton Roads. Two-thirds of the Atlantic bunkering trade was in New York Harbor.

Severe floods in Ohio in 1913 and labor troubles in Colorado and Wyoming decreased the output from these states, but the total for the United States continued to rise.

The by-product oven was rapidly supplanting the beehive type and it was estimated in 1914 that 25 percent of all coke manufactured in the United States was made in by-product or retort ovens. Due to the curtailment of copper smelting, the Rocky Mountain fields fell off in production. Owing to the war, the export trade assumed huge proportions. Prices remained firm and many stripping and steam shovel operations were opened. The average ratio of overburden to coal was 6.04:1.

Growth of Briquetting

Due to a shortage of men to operate them, the use of mining machines decreased in 1915. Briquetting grew rapidly into an industry of its own, the difficulty from heavy black tar smoke being largely overcome. Fifteen briquetting plants were in commercial operation. Car shortages and embargoes caused considerable inconvenience in the fall.

The labor shortage of 1915 referred to above caused extra attention to be paid to machine mining, with the result that in 1916, 13½ percent increase in output was secured, the average output per machine being 17,515 tons. Open cut operations increased 40 percent. Activity in iron and steel created great demand for coke. Car and labor shortage and inefficiency of labor were such that Pennsylvania mines could not supply their normal markets and coal from the central west was shipped to New York and New England.

Nineteen hundred and seventeen was an eventful year in the industry. The export situation created such a demand and offered such prices that a domestic shortage unsatisfied throughout the year, caused counterbidding and pyramiding prices, at which various regulatory measures were aimed, and which resulted ultimately in the fixing of prices by the Fuel Administration. Added to these difficulties were labor troubles, car shortage, priority orders, severe storms, and shortage of bottoms for coastwise shipments. On account of the increased cost of living the Fuel Administration in October

authorized advanced wages to the miners and 45 cents a ton to the operators.

Pooling of coal at Lake ports was started in June through the Ore and Coal Exchange at Cleveland. This seemed so helpful that the movement was extended to the ports of New York, Philadelphia, Baltimore and Hampton Roads on August 1, through pooling in the Tidewater Coal Exchange, which was made compulsory on November 11.

The Margin of Safety

C. E. Lesher, then connected with the Fuel Administration and the United States Geological Survey, stated that "The shortage lay in the quantity of coal required to change the fear of the consumer to confidence in his supply." Be this as it may, the margin of safety lay in ten million tons of unmined coal.

Sixty-five percent of the war order plants were located east of the Ohio River and north of the Potomac. Fifteen percent were in New England. To solve the problems intimate to this condition and to better cooperate with the government, the National Coal Association was formed.

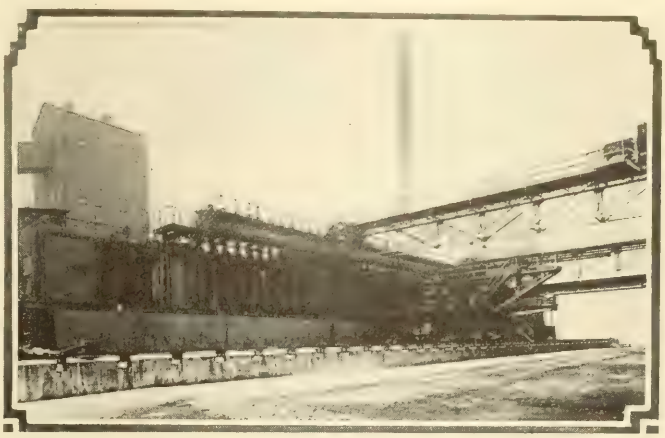
According to figures of the U. S. Geological Survey 7.5 percent more men working 5.7 percent more days, produced 10 percent more coal, with 79 percent of the mines working under an 8-hour day, mining efficiency being 97 percent that of 1916; 17,235 machines were in use, and 6,000,000 tons came from steam shovel operations.

The statistical compilations of the Fuel Administration brought to realization many hitherto unknown facts about the industry. In 1918 it was stated that 96 percent of the bituminous production is consumed in the United States, of which 86 percent obtains all rail delivery. Ninety-five percent of the bunker, coastwise, and export coal passed through the ports of New York, Philadelphia, Baltimore, and Hampton Roads. Of this amount 28 percent was bunker coal, corresponding very closely to the quantity consumed as railroad fuel in all rail shipments.

All Records Broken

All records were broken at lower Lake Erie ports, by the loading of 28,000,000 tons. The pooling system reduced the average car detention from 3½ days in 1916 to 1.59 days in 1918. Five hundred and thirty-six classifications of coal were thus reduced to 160, which number was later increased to 265. The lake-rail movement to the northwest is one of the great economic features of the industry, 200 out of 400 lake freighters being engaged in carrying coal to the head of the lakes and returning with cargoes of iron ore and grain.

This movement during the summer months affords a seasonal outlet for the mines and serves to stock the upper lake storages. The largest single dock at Duluth has a capacity of 800,000 tons of bituminous coal and 200,000 tons of anthracite. In addition to this, car ferries on Lakes Ontario, Michigan and Erie serve the Canadian trade. The distribution of the bituminous output for 1918, which amounted to 579,385,820 tons, and which constitutes the maximum ever produced in the country, was as follows:



A BATTERY OF BY-PRODUCT COKE OVENS

The part which the bituminous coal industry plays in the industrial life of the nation is greatly augmented by the production of highly valuable and widely diversified by-products, includng dyestuffs, chemicals, tar, ammonia, and the operation of the entire power houses of the mines furnishing the coal by the waste gases generated in coking. This last word in by-product ovens is the product of the Koppers Company of Pittsburgh, Pa.

	Tons	Pct.
Railroad fuel and bunker coal..	193,545,022	33.4
Consumed at the mines.....	12,521,446	2.2
By-product coke ovens.....	36,867,721	6.3
Beehive coke ovens.....	48,160,279	8.3
Manufacture of coal gas.....	4,965,832	0.9
Domestic, industrial and electric utilities	283,325,520	48.9

The compulsory pooling of coal at tidewater ports continued until February 28, 1919, when the shippers voluntarily agreed with the Railroad Administration, to continue the practice. The output for the year decreased over 110,000,000 tons, due to the shutting down of industry, following the armistice, and to the strike on November and December.

Many briquetting companies went out of business, but were revived in 1920 when especially in the eastern states, the output of briquettes increased 92 percent, the total production being valued at $4,623,831. Of the 45 plants in operation, 7 used anthracite culm, 2 used semi-anthracite fines, 1 used anthracite and bituminous fines mixed, and the others used lignite and similar mixtures as a base.

Bituminous Coal

Labor troubles continued in Alabama and West Virginia, due to the efforts of the United Mine Workers to unionize these strong non-union districts. The record high prices of the year caused many wagon mines to open, and due to the large number of open top cars which had gradually accumulated in the west, under the community-of-interest plan for joint use of rolling stock, by the Railroad Administration, serious car shortage resulted. Much discussion was had on the problem of "assigned cars." The year was significant because of four phases in the industry; first, filling the requirements caused by the strike of 1919; second, the phenomenal high prices and record tonnage over a period of three months; third, government control of prices and distribution; and fourth, the sudden drop in prices and production in the fall. The export situation became serious. Many large contracts and credits were cancelled. Numerous cargoes were shipped unsold, which resulted in a demoralized market, already handicapped by Fuel Administration and regulation, Shipping Board and license control, Interstate Commerce Commission orders and diversion of coal, and attempted radical legislation.

Voluntary tidewater pooling of coal was again made compulsory on February 25, 1920, and continued to April 30, when the railroads reverted to their owners. The Tidewater Coal Exchange, Inc., was then organized, an exchange at Charleston, S. C., was formed, and many earnest efforts were made at scientific classification, some of the exchanges entering into arrangements with the U. S. Bureau of Mines for systematic sampling, analysis, and classification. There were 53 recognized tidewater pools.

Forced to Disbandonment

This movement, however sound in theory, and practical in time of war, ultimately disbanded due to demurrage difficulties, and the trade jealousies of certain operators in a strongly competitive market.

Normal conditions of labor and car supply made 1921 a less strenuous year in the industry. A threatened railroad strike induced heavy buying in October, but the year closed with 5,000,000 tons less bituminous coal in storage than when it began, a total decline of 30 percent in output and 21 percent in value.

Petroleum

The union fields suffered from competition with the cheaper cost of production in the non-union districts. Alabama made a poor showing, however, on account of a circumscribed market and the depression of the steel business. The Tennessee operators reduced wages late in 1921 in order to compete with Alabama and West Virginia non-union coal. Local strikes and the increasing use of fuel oil cut the production of the central west fields 35 percent below 1920 figures. The Rocky Mountain district, dependent principally on railroad orders, operated at 73 percent.

Interesting developments of the year were the introduction of "air washing" tables for cleaning coal in the effort to avoid adding moisture to the coal; and the carbonization of high grade bituminous coal by the Carbocoal Company in Virginia, thus recovering valuable by-products and producing a substitute for anthracite fuel. Mechanical loading machines were being adapted to various underground conditions and were considered by many to be the solution of the constantly recurring labor problem.

Events in Kansas

The Industrial Relations Court of Kansas and the bombastic attempts of Alex. Howatt, a radical labor leader, to defy it; together with serious conflicts between union labor and the state authorities in West Virginia were the significant industrial events of the year. Gov. Kilby, of Alabama, accepted as an arbitrator in the industrial trouble there decided in favor of the open shop and that state and West Virginia were important sources of supply during the 4½ months' strike which followed in 1922.

PETROLEUM

THE HISTORY of the development of the petroleum industry consists of a staggering aggregation of figures, running annually into hundreds of millions of barrels.

Pennsylvania and New York began producing in 1859 and were followed by Ohio, West Virginia and California in 1875, Kentucky and Tennessee in 1882, Colorado in 1887, Indiana, Illinois, Kansas, Texas and Missouri in 1889, Oklahoma (then the Indian Territory) in 1891, and Wyoming in 1894. In 1896 the production was 61,000,000 bbls. and the average value was 96 cents per bbl. The Appalachian field furnished 55.7 percent, the Lima-Indiana field 41.4 percent, and the others 2.9 percent. These figures are of interest in comparison with the output of the various fields twenty-five years later.

Increase in Stocks

The following year stocks had increased, fewer wells were drilled, and the average price dropped to 67.6 cents per bbl. The highest priced oil was the lubricating oil of Wyoming which averaged $8 per bbl. Kansas crude oil was the lowest at 40 cents per bbl. West Virginia was rapidly coming into prominence, its production showing 30.6 percent increase over 1896. In 1898 the average distillation of 100 gallons of crude petroleum yielded 76 gallons of illuminating oil, 11 gallons of gasoline, benzine and naphtha, 3 gallons of lubricating oil and 10 gallons of residuum and loss.

Stocks and exports having decreased in 1899, prices increased and many new wells were drilled. Pennsylvania furnished 62 percent, Ohio 23 percent, West Virginia 9.3 percent, Indiana 3 percent and California 1.5 percent of the year's total.

The average price in 1900 was $1.20 per bbl. The next year 1,578 new companies were organized, principally in Texas and California. New York was the principal port of export. In 1902 the low grade oils of Louisiana were brought in, and in 1903 California made the greatest increase. The continued output of the newer fields in the south and west and the large quantity of oil used as fuel caused a shifting of interest from the older to the newer fields. Average prices increased 14 cents per bbl. Exports declined and stocks held in tanks increased. The rapid increase in production in Texas, Louisiana and California necessitated large investments in tanks, pipe lines, tank cars and tank vessels. The use of oil as an enricher of manufactured gas and as fuel increased rapidly. Improved methods of refining the low grade Texas oils augmented their value. It was estimated that 3.8 bbls. of southern and western petroleum was equal in value to 1 bbl. of eastern petroleum. During this year 18,880 new wells were drilled at an average cost of $1,400 per well.

High Production Mark

The value of 1904 production passed one hundred million dollars. For the first time the quantity produced west of the Mississippi River was greater than that produced east. The internal combustion engine was becoming an important factor and the demand for gasoline grew rapidly. New pools were discovered in Southeast Kansas and Northern Oklahoma. California produced over 25 percent of the entire output of the United States, although Ohio led in value. 1905 developments in the Mid-Continent field and the extension into Illinois of the Lima-Indiana field indicated great increase in production of lighter grade oils. Another trunk pipe line was built from Kansas to Indiana. It was at this time that quantity alone ceased to indicate production; kind and quality of oil controlled the value. Petroleum as fuel continued to increase. The average price for the year was 62½ cents per bbl.

In 1906 the consumption of fuel oil in California exceeded the total production of the state in all grades. The eastern fields began a general decline while the western fields increased. A pipe line was built across the Isthmus of Panama for the delivery of California oil to the Atlantic Ocean. The yearly average was 73 cents per bbl.

Prices remained uniform throughout 1907, large stocks accumulated and many new wells were brought in. Efforts were made to amend the Dingley Tariff Act so that no duty should be collected on petroleum imports. 1908 was a year of disastrous floods and thunder storms in the west, while a severe drought in the east hampered drilling. The following year California passed Oklahoma as a producer and West Virginia rose from sixth to fourth place. The rapid growth of locomotives on American railroads to tonnages precluding single coal-firing, led to the introduction of oil burners on many systems. Two battleships in the U. S. Navy were equipped with auxiliary oil burning plants. In 1910 the production passed 200,000,000 bbls., a gain of 14.4 percent over 1909. Reserve stocks being heavy, the average price was 61 cents per bbl.

Efforts to Curtail Output

Petroleum production increased so rapidly all over the world that in 1911 efforts were made to curtail the California output. Such a large number of new operators were bringing in wells, however, that the California reserve increased to 44,000,000 bbls. Notwithstanding this unprecedented increase,

prices advanced due to increased demand.

The growth of the automobile industry called for increased quantities of gasoline. Up to this time gasoline had been left to some extent in kerosene, and was the frequent cause of lamp explosions. With the increased demand for gasoline came improved methods of refining and the quality of kerosene greatly improved.

The production for 1912 just equalled that of the first 24 years of the industry, and exceeded that of all other countries by 72 percent. Importations of gasoline from the East Indies relieved the demand on the Pacific Coast. The opening of the Panama Canal affording transit to oil burning steamers and to tank transport, had a marked effect on Pacific Coast oil and it was predicted by many that the flow of oil through the Panama pipe line might be reversed.

Adjustment Found Necessary

It became necessary to readjust the relations between gasoline, kerosene and lubricating oils. The latter are used directly in proportion to the amount of power in operation. Gasoline growing rapidly in demand for motor vehicles, large power applications calling for lubricants, a material surplus of kerosene appeared, so that a special trade propaganda was carried on in the Far East to increase the use of oil lights in such countries as China. Notwithstanding this accumulation of kerosene and the advent of gas and electricity, the per capita consumption of kerosene in the United States was 25 gallons per year.

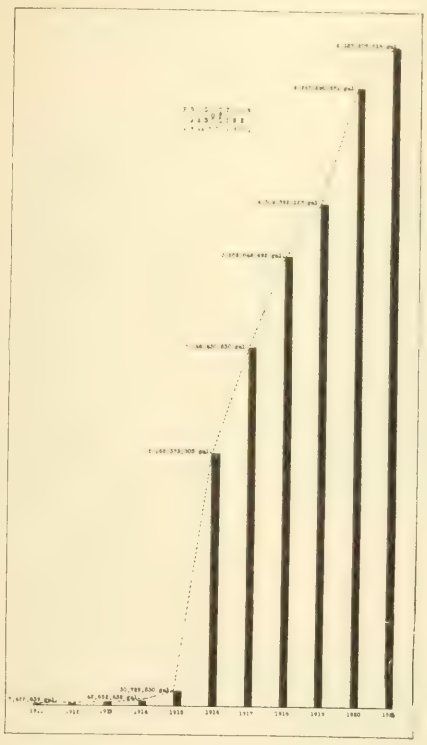
As the price of oil advanced railroads reverted to coal. The average efficiency had been 3.61 miles per bbl. The Navy, however, extended its oil holdings, and set aside Elk Hills and Buena Vista fields in California as naval reserves.

Many of the California wells brought in in 1913 were gushers and attempts were made to restrict drilling, but without success due to the continued increase in demand. In 1914 the trunk lines were ruled to be common carriers, which necessitated several of the small producers building field storages. Mexican oil became a factor in the market and prices dropped.

Liquid petrolatum began to replace Russian oil for medicinal purposes. The U. S. Geological Survey in 1915 aptly summed up the situation as follows:

> "Increased realization of the importance of the petroleum industry has brought a recognition of the fact that the petroleum reserves of the United States are not inexhaustible. In two years the industry has passed from an era of high prices and threatened shortage, through a period of over production and low prices, and emerged with greatly enlarged refining capacity to face another threatened shortage."

The rapid rise to abnormal prices following excessive production gave great concern. Wildcatting was active. Many new processes were evolved for the recovery of gasoline, aromatic hydrocarbons and dye stuffs from crude petro-



leum. Litigation followed the withdrawal of the reserves by the Navy.

War Makes Demands

The 1916 demand for motor fuel and lubricating oil due to the war, and the rapid development of submarines and airplanes still further stimulated the industry, which was greatly hampered by scarcity of pipe, casings, and wire rope. Many individual interests were consolidated, and chemical research developed a higher recovery of the higher distillations.

A decision of the District Court of the United States in the Southern District of California definitely established the rights of locators on oil lands, while a decision of the United States Circuit Court of Appeals affirmed the rights of citizens making bona fide development to maintain title against withdrawal.

The year 1917 was a year of trials and tribulations to the industry. Government delay in providing for opening of reserved oil lands, shortage of water for drilling, difficulty in securing supplies, high prices, shortage and inefficiency of labor, and uncertainties of pending tax legislation, all combined to deplete stocks and delay new wells coming in. The average price was $1.56 per bbl. The most significant discoveries were in north central Texas, where large areas of high grade oil were developed.

Under Federal Power

The following year the industry was under the U. S. Fuel Administration working in conjunction with the National Petroleum War Service Committee. In January an order was issued exempting petroleum and its products from embargoes on all railroads. The increase in production was good, prices were stable, and the deficit was made up from Mexico, notwithstanding more or less irregularity due to political conditions existing there at that time.

The development of gasoline from natural gas became an established industry, supplying motor fuel without destroying the gas, and also utilizing the previous surplus of distillates formerly of little commercial value. Gasoline production from natural gas in 1917 was 110 percent over that of 1916, and 30 percent greater in 1918 that in 1917. Drips from gas mains added to the total, which was secured from 1,004 plants.

The continued growth of the industry regardless of post-war readjustments is seen in the production for 1919 and 1920, which was 361,520,153 barrels and 433,915,029 barrels respectively, followed by an estimated output in 1921 of 443,362,657 barrels. The use of peg models, first developed in California in 1915, has done much to eliminate useless drilling. After a few wells have been drilled in any area and properly logged in the peg model of that area, the stratigraphy may be visualized and drilling thereafter reduced to an exact science within the described district.

Results of Foresight

The miscroscopic examination of core cross sections is the latest method of determining the strata through which drilling is progressing. State supervision of abandoned wells, restriction of rotary drilling to proven fields, and peg model records of all holes drilled, are among the regulations of certain oil producing states whose legislative foresight is keenest for the welfare of the industry.

ANTHRACITE COAL

A SYSTEMATIC MARKETING campaign for the smaller sizes, and the efforts of the anthracite operators to restrict production, which was accomplished by operating the mines three or four days a week, resulted in a decreased production in 1896, although the value of the product was greater than

the preceding year. The average price at the mines was $1.85 per long ton.

Development vs. Demand

The U. S. Geological Survey in 1907 called attention to the fact that due to overdevelopment of the anthracite field mines were frequently closed down from one-third to one-half the time, and fixed charges, due to enormous expense in acquisition of large properties and construction of plants, made it impossible to decrease the cost of production so as to compete with bituminous coal for steam purposes, or with gas for cooking. The production of anthracite pig iron decreased 200,000 tons in one year. During the succeeding years conditions grew more acute. The efforts to restrict production in order to maintain prices were found also to restrict the markets and to favor bituminous coal. It was estimated that colliery consumption for power and washing purposes was 8 percent of the output.

PRIDE OF THE ANTHRACITE INDUSTRY

This Marvin breaker, owned by the Hudson Coal Company, is the largest and most modern anthracite plant in the country

In 1900 a strike during the summer and fall decreased the annual output 2¾ million long tons. Many washeries were built which increased the quantity of steam sizes on the market, much of which was purchased and mixed with bituminous fines for steam purposes.

The result of this, the first important strike in the anthracite field, was a compromise by which the miners gained an average increase of 10 percent in wages. Immediately following this, the average production per man per day fell to 2.37 tons.

The gradual elimination of anthracite in manufacturing and its use almost entirely as a domestic fuel, and the construction of many sky scrapers and apartment houses using steam and hot water heat generated by bituminous coal, in 1901, caused still more strenuous efforts to dispose of anthracite steam sizes. The average price increased 25 cents a ton at the mines. Prepared sizes constituted 60 percent of total shipments, which went forward over eleven initial railroads.

Another strike began May 12, 1902, and lasted until October 25 of that year, when a commission was appointed by the President of the United States to investigate the situation, and the miners returned to work. Due to a shortage of rolling stock and motive power on the railroads, a hard coal famine ensued the following winter.

The appointment of the Presidential Commission carried an agreement to abide by its decisions for three years. Unprecedented activity resulted in 1903 and prices reached the highest point in 24 years. Labor received the highest wages yet paid per unit of work performed, while the average number of working hours per day was shortened. Regular production of anthracite eliminated long hauls for bituminous coal, transportation facilities improved, and industrial conditions were generally good.

Seasonal freight rates were taken advantage of, and the opening of navigation brought maximum shipments. An early fall and cold winter, however, caused occasional shortages.

In 1904 the U. S. Geological Survey attempted to educate the public to the necessity for the anthracite operator to make his profit on domestic sizes, since the fines must be sold at a loss, thus accounting for the apparent discrepancy between the price at the mines and at the point of consumption.

A year later the miners became more concerned over the possibility of a strike at the expiration of the three-year agreement than they were over working, with the result that man-production decreased, costs rose accordingly, and anthracite became still more of a luxury. It was then estimated that 67½ percent of the total production was consumed in Pennsylvania, New York and New Jersey, 14 percent in New England, 3 3-5 percent went into export, and the balance scattered.

The much-discussed strike occurred April 1, 1906, but after a considerable parley the miners accepted a renewal of the previous award for another three years.

The practice established in 1901, of allowing a seasonal differential in the summer months, proved in 1907 a great stabilizer. Although business fell off in the business centers of the east in 1908, the increased population very nearly balanced the consumption. The Anthracite Coal Commission award was again renewed in 1909 for another three years, thus proving the fairness of that method of adjudicating labor differences.

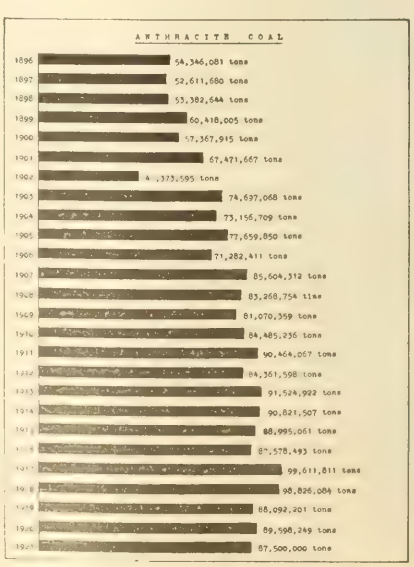
The recovery of coal from washed culm banks amounted to over 4,000,000 tons. Dredging for anthracite coal brought down by the Susquehanna and smaller rivers became a feature of the industry, and in 1910 approximately 100,000 tons were thus recovered. The export trade continued to increase, over half a million tons being exported in 1911.

The triennial period having again elapsed, mining was suspended on April 1, 1912, for six weeks, while the wage scale was in conference. An advance of 10 percent was granted the miners and the price of anthracite advanced accordingly.

The Situation in 1913

It was stated that 175,745 men were employed in the industry in 1913. Mild weather and increased use of pea coal in steam and hot water heating plants caused a decrease in production in 1914. Car shortage and frequent embargoes created difficulty in delivery during the fall of 1915, while pea coal, taking a lower freight rate, became very popular and was no longer sold below the cost of production. Washed coal comprised 4 percent of total shipments. Steam shovel and machine mining became a sufficient factor in anthracite mining to warrant special record by the U. S. Geological Survey.

Nothing of note occurred in 1916. Nineteen hundred and seventeen, however, saw the high water mark of production, which will, in all probability, remain a record—99,611,811 tons. The principal factor limiting production was labor. Prices were held level by the large companies. New problems of dis-



tribution arose due to the shifting of large centers of industrial population.

The demand for anthracite not only as a domestic fuel, but for the manufacture of water gas, to replace coke withdrawn from the iron industry, and for military purposes, was greater by several million tons than the production, and supplies were drawn heavily from stocks at the upper lake docks and elsewhere.

New Demand Created

The shortage of bituminous coal created such demand for steam sizes of anthracite that the output of washeries and dredges increased 53.4 percent. Many new central power stations and the utilization of lower grades of fuel helped to economize in the use of fuel for operating mines and breakers.

Nineteen hundred and eighteen was a historic year in the coal industry. Every feature, from production to consumption, was controlled by the Fuel Administration. Production was restricted by a decrease of 18 percent in the number of miners. Distribution was based by the Fuel Administration on that of 1916-17 with the exception of certain sections in the south and west where bituminous coal was available. No price having been fixed by the government on steam sizes, a healthy competition arose between anthracite fines and bituminous slack. The influenza epidemic in October caused a considerable reduction in output the balance of the year.

The following three years the production averaged 88½ million tons per year. In July, 1920, the miners of the Pennsylvania Coal Co. struck because of the contract system, and these mines, near Pittston, Pa., were idle for three months. This, and the outlaw switchmen's strike in April, and "vacation" strikes in September, caused a shortage that year.

The New England situation was aggravated by embargoes from April 1 to August 31, during which 150-day period there were only 30 days on which coal could be shipped without special permit to New Haven Railroad territory. A two months' strike of the towboatmen in New York Harbor demoralized deliveries and transfer of coal from the New Jersey side, so that late in the year, due to overbidding for coal, prices began to pyramid.

The business depression of 1921 resulted in the shutting down of many washeries and dredges, thus reducing the available output by 3,000,000 tons. The percentage of prepared sizes on the market therefore increased. It was stated that 11 percent of the total production was used in the operation of collieries.

An Erratic Year

Bituminous coal being basically an industrial fuel, anthracite became essentially a domestic fuel. In 1921 stove and chestnut sizes were most in demand and also the most expensive. Egg and pea coal were hard to move. The year was an erractic one for the trade.

The Pennsylvania Legislature imposed a tax on anthracite, ignoring bituminous coal. Penalties were also imposed upon operating companies causing surface subsidences. Both these acts were appealed to the courts, and mining under the city of Scranton was resumed, pending the decision.

Of national interest were the decrees of the U. S. Supreme Court ordering the complete separation of railroad and mining interests in the Reading and the Lehigh Valley cases.

There was no serious labor trouble during the year. Under a few flimsy pretexts the operations of the Lehigh Coal and Navigation Co. were shut down by the miners for a few weeks, costing them a loss in wages of $750,000. Due to the increase of 17.4 percent previously awarded the miners by the Anthracite Coal Commission, the cost rose to $3.85 per ton at the mines.

It is evident that the day of cheap anthracite is past. It is now necessary to mine thinner and deeper veins of coal, which require more expensive timbering, offer greater quantities of water to be pumped to increased heights, necessitate ventilation, labor, and mechanical equipment, while yielding less tonnage at a greater cost. In the face of this condition the close of 1921 saw the miners asking a 20 percent increase in wages, with a list of 19 demands, notwithstanding the inevitably higher costs to the operators and an excess of steam sizes to be disposed of.

IRON

DEPRESSION RULED the iron and steel industry in 1896. Many mines were closed down. Prices ran from $2.50 to $3.50 per ton for specular and magnetic ores, and from $2 to $3 per ton for red hematite ore, at the lower lake docks. Experiments were being made in Alabama in the production of basic steel and in the beneficiation of ores. The iron mines of Pennsylvania and New York were beginning to feel the effect of the extensive development of Lake Superior ores, and cheap lake transportation. Deposits in Colorado, New Mexico and Wyoming were being exploited. The total output came from twenty-three states, Michigan leading in production.

The Record Output

Although insignificant in comparison to later tonnages, the output of 1897 was then the largest ever recorded by any country in one year. The amount was

17,518,046 tons valued at $18,953,221. Vermont became a producer, and Minnesota continued to open up many new properties. Thirty percent of the ore came from open cuts and 70 percent from mines. The prices were low and many blast furnaces idle. Alabama ranked next to Michigan in production of red hematite. Pennsylvania led New York in the production of magnetite, with Ohio and Maryland leading in carbonate ore. Thirty-three thousand nine hundred and twenty-four tons of spiegeleisen, valued at 55 cents per ton, were manufactured from zinc residuum.

Increase in Production

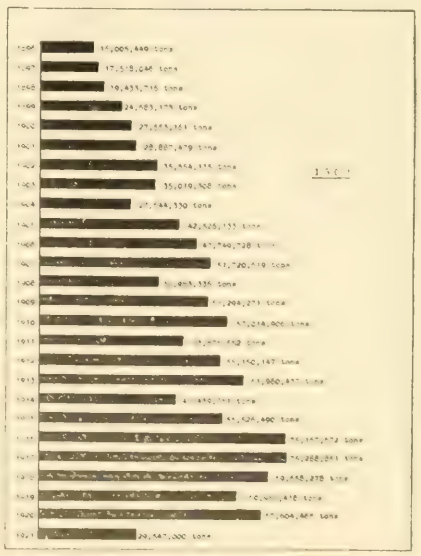
Improved methods of mining increased the man-output per day, and in 1898 the United States produced one and a third million tons more than Great Britain in her banner year. Lake transportation costs were reduced from $1.35 to 60 cents per ton.

Installation of larger cars and heavier engines, terminal facilities, etc., by the railroads also reduced transportation to a point where ore was delivered and sold to the furnaces at a lower figure than the previous cost of lake transportation alone.

With the exception of 1904 and 1908 the industry showed steady increase in output each year. The highest average value ore came from New Jersey, and the lowest from Texas, the one due to high mining costs and low transportation costs, the other using convict labor, but being far removed from the furnaces.

In 1900 the relation of iron ore to domestic pig iron was 1.83:1. Many large iron ore mines effected a consolidation, and, for the first time in history, the United States made more open-hearth steel than Great Britain.

South Carolina made some shipments of iron ore in 1901.

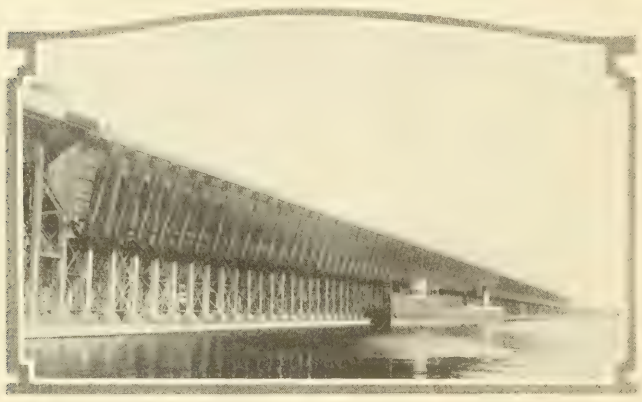


Iron

Great rivalry existed between Minnesota and Michigan over state rank in production and shipment. Many new explorations were carried on in the Lake Superior district, and the Irondale furnace in the State of Washington resumed operations, but depended upon ore from British Columbia.

End of Controversy

In November, 1901, the five-year legal controversy between the iron ore handling railroads and the Minnesota State Railway Commission was ended, the Commission admitting its lack of jurisdiction.



A MASSIVE MILE STONE IN INDUSTRY

This iron ore dock, the largest in the world, owned and operated by the Duluth, Missabe and Northern Railway, plays an important part in the movement of iron ore from the head of the lakes

Increased use of steel for structural purposes, steel railway cars, increased track renewal and railroad extensions, large quantities of rolling stock, steel bridges, electrical machinery and steel vessels, all made an unprecedented demand upon the steel industry. It was estimated that one-half the total production of steel in the United States went into steel skyscrapers and steel bridges.

The output of 1902 was double that of 1897. A long winter confined lake shipments to 200 days. The highest average value of ore was in Colorado, $3.52; the lowest in Texas, 99 cents. The industry was further handicapped by an anthracite strike and car shortage which delayed delivery of raw material and removal of finished product.

Prosperity was suddenly checked in 1903 by a sharp reaction in the stock market. The steel for 91% of the structural ships came from the mills of Pennsylvania.

Nineteen hundred and four was a dull year. In October a general improvement was manifested and railroad demand for steel became excessive. Iron, steel and coke employes received an increase of from 10 to 20% in wages.

Production Again Increased

Explorations were carried on in the Cayuna Range in Minnesota during 1905. Production again increased, and it was stated that the metallic iron produced in the United States during the year exceeded that from the iron ore of Germany, Luxemburg, the United Kingdom, and Spain. Much progress was made in electric smelting and nodulizing.

The per capita consumption of iron ore had risen from 806 lbs. in 1900 to 1,344 lbs. in 1907. A panic in the latter part of the year, however, caused many cancellations and general business depression, which continued well into the following year. Open-hearth production passed that of Bessemer steel. The increased cost of iron due to higher cost of fuel and the use of lower grade iron ores created a demand for improved metallurgy. An agreement was made by the principal iron and steel manufacturers to refrain from destructive competition. In February, 1909, an open market was declared on finished products, except steel rails, with the result that prices reached new low levels. The increase in production was 42 percent. Pig iron produced in 1910 exceeded all previous records and because of curtailed buying by railroads and manufacturers, left large stocks to be carried over into 1912.

Shipments were started from the Cayuna Range, and metallurgists were recommending conservation of ores by beneficiation. Ferro alloys were beginning to receive attention.

In 1912 Minnesota produced 62½ percent of the total. The following year production again exceeded all previous records, and the price rose 31 cents above 1912. The production of iron ore for paint and pigment became a recognized industry. Due to another business depression in 1914 the industry was obliged to operate at full capacity to make a profit or else close down. Many of the southern companies kept their mines and furnaces in operation to furnish employment to the army of employees dependent upon them.

The latter half of 1915 was prosperous due to the ship building orders. The largest ore dock in the world was opened at Duluth by the Duluth, Missabe and Northern Ry. This dock, of steel and concrete, is 2,304 feet long, with a storage capacity of 153,600 gross tons.

Idaho Drops Out

High water and good weather, aided by teamwork between the lake fleets and the ore carrying roads, brought the annual output up to three-quarters of a billion tons, in 1916. Idaho ceased to be a producer of iron ore. Michigan, New York and Wisconsin contributed the ore used for paint manufacture. Prices increased 28 percent. Beneficiation had developed 15 processes.

Nineteen hundred and seventeen was a year of unfavorable weather, shortage of labor and transportation facilities, coal and coke. Government control of prices made metal needed for war purposes available, but the demand far exceeded the supply. The ratio of pig iron manufactured to iron ore consumed, had risen from 35 percent to 51 percent in 17 years. Notwithstanding its handicaps, this was the high record year of production in the history of the industry, 75,288,851 tons.

The following year was devoted wholly to the requirements of the government. Heavy snows, railroad congestion, priority orders, influenza epidemic, and inefficient labor all combined to produce strenuous conditions. During this year the pig iron ratio reached 54 percent.

Large Exports Made

Large exports to Italy helped the readjustment of 1919. With a greatly increased capacity for production, returned soldiers without work, and unwillingness to accept reduction in pay, war time prices continued and labor difficulties increased. A temporary "pick-up" was experienced in the early part of 1920 during which time the output of electric steel and alloy steel ingots and casting remained high. Eighty-six percent of the total production of ore came from the Lake Superior district. The Birmingham-Chattanooga district decreased 16 percent. Two sets of prices were maintained throughout the year between the steel corporation and the independents. A significant decision was rendered by the Supreme Court to the effect that the U. S. Steel Corporation was not a trust in violation of the Sherman Act. Shortly after, the Federal Trade Commission decided that the Pittsburgh Basing System for fixing steel prices was not a violation of the Clayton Anti-trust Act.

Government control ended April 1, and was followed by the switchmen's strike which hindered delivery and sent prices of coal and coke soaring. The automobile industry, forced to make its own deliveries on tires, necessarily slackened as its raw materials failed of delivery.

(*Continued on page* 965)

THE TARIFF AND THE MINING INDUSTRY

By Herbert Wilson Smith

THE THREE YEARS onslaught that the industries of the United States have made upon Congress for tariff legislation is over. The recurring phalanxes of earnest citizens armed with brief cases and specific and ad valorem rates which have swept over the walls of the Ways and Means and Senate Finance Committees have charged for the last time. They have gone home and individually have put away their walking sticks and winged collars and their Washingtonian airs of mystery. They are now gathered about their firesides, their clubs, or the village stores telling in detail how they each of them solely, individually and alone is responsible for the rate of duty which has finally been provided on reindeer meat, nut blanks, or lily bulbs and pips; or that they are solely responsible for keeping fish sounds, leeches or punk on the free list, as the case may be.

A Serious Proposition

Tariff to the man whose industry is at stake is a serious proposition. The statement that tariff is a local issue so often quoted and variously ascribed to past orators on tariff questions, is too broad a definition. Tariff is not a local issue—tariff is an individual issue and is individually important to those interested in the industry which requires protection. For that reason it immediately becomes a national issue because it affects the whole economic body of the country.

A man gets up before a committee and says:

"Gentlemen, I am a republican. I have been a republican for twenty years, and I am interested in tomato catsup." We laugh. This is funny to us. Funny not because he is both a republican and interested in tomato catsup. That may be eminently proper. We may merely laugh with relief because he is interested in tomato catsup and we are not, but to him it is quite serious. To him the question of whether he shall make tomato catsup in competition with other American manufacturers or in competition with tomato catsup from Italy may mean the life or failure of his business. Those interested in protection for their own products often take the same attitude toward protection for other products that we take toward the man who is interested in tomato catsup.

Each one of us understands his own business so thoroughly that he feels that the duty on fire crackers or ostrich plumes can be made a national issue, while the duty on explosives or ostrich feed is an economic crime.

Much Treading on Toes

In the close marching of the phalanxes referred to above there is a great deal of treading on one another's toes. The man just a step behind in the scale of manufacture steps on the toes of the man ahead of him when his finished product comes from that man's raw material, and that man, in his effort to solve his own economic problem, is likely to kick back in trying to keep what he buys on the free list, while he gets protection on the thing that he manufactures himself.

HERBERT WILSON SMITH
Chief, Tariff Division, American Mining Congress

For the first time in the history of tariff legislation a concerted, determined effort was made to determine adequate protection for all the products of the mining industry whose developments and abundance of resources justify such an effort, and it is a gratification now to realize that this effort has been followed by a very substantial conquest.

Under the tariff bill as now a law by the signature of the President, the products of the mining industry are guaranteed a measure of protection which will mean the possibility of continuous permanent development.

Early in 1919, when the question of tariff on various products in the mineral industry first came up, the statement was made that this would be at least a three years' struggle against apparently overwhelming odds. Three years seemed a long time, and the difficulties in the way of securing adequate protection unsurmountable. Certain mineral products, such as manganese and magnesite, for example, which are consumed almost in entirety as the raw material of huge industries, were dismissed with a wave of the hand by almost every economist with whom the matter was discussed and by many of the producers of these minerals themselves.

Many Gloomy Predictions

Both made the statement that "tariff on some products of mineral industries, yes, but for these industries which must sell their products to these huge corporations, no, you will never get it. They will fight you too hard and you cannot hope to win." To the representatives of the various mineral industries who were not discouraged by such gloomy predictions and to continous effort of those men who have unselfishly spent a great deal of time in Washington in support of the legislation necessary for their industries, is due, in a large measure, the rates of duty on the industries which have finally been protected.

To those members of both the House and Senate who fought so vigorously for economic justice for the mineral products of their states, the mining industry owes a debt of which it is deeply conscious.

The present tariff bill is written on the plan of foreign valuation. While the Mining Congress supported the plan of American valuation, and still believes it to be the most adequate way of leveling duties, most of the mineral and metal schedules are based on specific rate of duty, so the American valuation plan did not apply to them. The mining industry realizes that it was only part of the problem. We realized that we could not sell our lead, our zinc, or our tungsten to American manufacturers bankrupt from foreign competition, nor could we sell our coal to factories with idle smokestacks.

The Vital Concern

It became, therefore, our vital concern to support this principle of American valuation because it offers the most adequate protection for the American industry. In abandoning the plan of American valuation, the ad valorem rates provided by the House were in-

creased by the Senate to make them as nearly commensurate as possible on a basis of foreign valuation. Hearings on the tariff bill began in the House in January, 1921. The tariff bill passed the House and was referred to the Senate July 21, 1921. Hearings immediately began before the Senate Finance Committee. During the first six months no satisfactory progress was made in the final draft of the bill. It was not until April 11, 1922, that the Senate Finance Committee finally reported the bill to the Senate.

Two Important Items

The report provided for two items of vital importance to the mining industry on a basis which was entirely contrary to the interests of the industry. It provided for manganese on the free list and for a duty of 10 percent ad valorem on cyanide. Senator Oddie, of Nevada, led the fight for free cyanide, in which all party lines were forgotten. Senator Pittman, of Nevada, was equally vigorous in his support of free cyanide for the metals industry. After a most bitter debate on the floor of the Senate on May 29, 1922, cyanide was restored to the free list by an overwhelming vote of 46-14.

Senator Nicholson, of Colorado, was the Senate leader in behalf of protection for manganese. Following the adverse report of the Senate Finance Committee, the Western Tariff Bloc held many meetings on the question of manganese, in which hearings and conferences as adequate as those before the Senate Finance Committee on the manganese question took up in detail questions of reserve tonnage, grades of ore, etc. Producers from all over the United States appeared, and a most satisfactory showing was made to the tariff bloc, so satisfactory, indeed, that the House rates on manganese were recommended. The manganese schedule was adopted on June 5, 1922, following impassioned appeals by Senator Nicholson, of Colorado, in behalf of producers of manganese and by Senator Walsh, of Montana, whose summing up of the reserves of his state and the nation was masterly. These two schedules were the most bitterly-contested on the floor of the Senate of any which affected the mining industry. And in each case the recommendation of the Finance Committee was reversed.

The conference completed its report September 14 and the bill became a law by the agreement of both Houses on the conference report and the signature of the President September 21.

This tariff bill provides, however, that the President shall have the power to raise or lower rates to the extent of 50 per centum of the rates as now provided by the new law. This means that immediately those rates which were attacked on the floor will be subject to attack before the tariff commission. It immediately becomes possible for any opponents to any rate to attack this rate before the tariff commission. That some of the rates which were passed only after a bitter fight will be attacked goes without question. That continued vigilance on the part of every industry operating under the tariff is necessary is also apparent. So we cannot rest in serenity but must vigilantly guard what we have won by so hard a battle.

The Rates Follow:

Aluminum, aluminum scrap, and alloys of any kind in which aluminum is the component material of chief value, in crude form, 5 cents per pound; in coils, plates, sheets, bars, rods, circulars, disks, blanks, strips, rectangles, and squares, 9 cents per pound.

Antimony Ore (free), regulus or metal, 2 cents per pound; needle or liquidated antimony, one-fourth of 1 cent per pound.

Oxide, 2 cents per pound, tartar emetic or potassium-antimony tartrate 6 cents per pound; sulphides and other antimony salts and compounds, not specially provided for, 1 cent per pound and 25 per centum ad valorem.

Arsenious acid or white arsenic Sulphide of arsenic (free), Metallic arsenic, 6 cents a pound.

Asbestos, unmanufactured, asbestos crudes (free.)

Barytes Ore, crude or unmanufactured, $4 per ton; ground or otherwise manufactured, $7.50 per ton; precipitated barium sulphate or blanc fixe 1 cent per pound.

Bauxite, crude, not refined or otherwise advanced in condition in any manner, $1 per ton; refined Bauxite, one-half of one cent per pound.

Bismuth, 7½ per centum ad valorem.

Cadmium, 15 cents per pound.

Chromite or chrome ore (free).

* * * ferrochrome or ferrochromium containing 3 per centum or more of carbon, 3½ cents per pound on the chromium contained therein; ferrochrome or ferrochromium containing less than 3 per centum of carbon, 30 per centum ad valorem.

* * * Chrome brick, 25 per centum ad valorem.

Chrome yellow, chrome green, and other colors containing chromium, in pulp, dry, or ground in or mixed with oil or water, 25 per centum ad valorem.

Cyanide: Potassium cyanide, sodium cyanide, all cyanide salts and cyanide mixtures, combinations, and compounds containing cyanide, not specially provided for (free).

* * * **Flourspar**, $5.60 per ton.

Graphite or plumbago, crude or refined: Amorphous, 10 per centum ad valorem; crystalline lump, chip, or dust, 20 per centum ad valorem; crystalline flake, 1½ cents per pound. As used in this paragraph, the term "crystalline flake" means graphite or plumbago, which occurs disseminated as a relatively thin flake throughout its containing rock, decomposed or not, and which may be or has been separated therefrom by ordinary crushing, pulverizing, screening, or mechanical concentration process, such flake being made up of a number of parallel laminae, which may be separated by mechanical means.

* * * China clay or Kaolin, $2.50 per ton.

Lead-bearing ores and mattes of all kinds, 1½ cents per pound on the lead contained therein: Provided, That such duty shall not be applied to the lead contained in copper mattes unless actually recovered.

Lead bullion or base bullion, lead in pigs and bars, lead dross, reclaimed lead, scrap lead, antimonial lead, antimonial scrap lead, type metal, Babbitt metal, solder, all alloys or combinations of lead not specially provided for, 2⅛ cents per pound on the lead contained therein; lead in sheets, pipe, shot, glazier's lead, and lead wire, 2⅝ cents per pound.

Lead pigments: Litharge, 2½ cents per pound; orange mineral, 3 cents per pound; red lead, 2¾ cents per pound; white lead, 2½ cents per pound; all pigments containing lead, dry or in pulp, or ground in or mixed with oil or water, not specially provided for, 30 per centum ad valorem.

Crude magnesite 5/16ths cent per pound; caustic calcined magnesite, ⅝ths of 1 cent per pound; dead burned and grain magnestie, not suitable for manufacture into oxychloride cements, 23/40ths cent per pound.

* * * Magnesite brick, ¾ths of 1 cent per pound and 10 per centum ad valorem.

Metallic magnesium and metallic magnesium scrap, 40 cents per pound, magnesium alloys, powder, sheets, ribbons, tubing, wire and all other articles, wares, or manufactures of magnesium, not specially provided for, 40 cents per pound on the metallic magnesium content and 20 per centum ad valorem.

Manganese ore or concertates containing in excess of 30 per centum of metallic manganese, 1 cent per pound on the metallic manganese contained therein. * * * Ferromanganese containing more than 1 per centum of carbon 1⅞ cents per pound on the manganese contained: Provided, That ferromanganese for the purpose of this Act shall be such iron manganese alloys as contain 30 per centum or more of manganese.

Iron ore, including manganiferous iron ore * * * (free).

Mica, unmanufactured, valued at not above 15 cents per pound, 4 cents per pound; valued above 15 cents per pound, 25 per centum ad valorem; mica, cut or trimmed, and mica splittings, 30 per centum ad valorem; mica plates, and built-up mica, and all manufactures of mica or of which mica is the component material of chief value, 40 per centum ad valorem; ground mica, 20 per centum ad valorem.

Molybdenum ore or concentrates, 35 cents per pound on the metallic molybdenum contained therein; * * * ferromolybdenum, metallic molybdenum, molybdenum powder, calcium molybdate, and all other compounds and alloys of molybdenum, 50 cents per pound on the molybdenum contained therein and 15 per centum ad valorem.

Ores of nickel; and nickel matte (free).

Nickel oxide, 1 cent per pound; nickel, and nickel alloy of any kind in which nickel is the component material of chief value, in pigs or ingots, shot, cubes, grains, cathodes, or similar forms, 3 cents per pound; in bars, rods, plates, sheets, strips, strands, castings, wire, tubes, tubing, anodes or electrodes, 25 per centum ad valorem.

Oils, mineral: Petroleum, crude, fuel, or refined, and all distillates obtained from petroleum, including kerosene, benzine, naptha, gasoline, paraffin, and paraffin oil, not specially provided for (free).

Potassium chloride or muriate of potash, potassium sulphate, kainite, wood ashes and beet-root ashes, and all crude potash salts not specially provided for (free).

Sulphur in any form, and sulphur ore, such as pyrites or sulphuret of iron in its natural state, and spent oxide of iron, containing more than 25 per centum of sulphur (free).

Quicksilver, 25 cents per pound.

Azides, fulminates, fulminating powder, and other like articles not specially provided for, 12½ cents per pound.

Calomel, corrosive, sublimate, and other mercurial preparations, 45 per centum ad valorem.

Vermilion reds containing quicksilver, dry or ground in or mixed with oil or water, 28 cents per pound.

Tin in bars, blocks or pigs, and grain or granulated and scrap tin (free).

Tin ore or cassiterite, and black oxide of tin (free): Provided, That there shall be imposed and paid upon cassiterite, or black oxide of tin, a duty of 4 cents per pound, and upon bar, block, pig tin and grain or granulated, a duty of 6 cents per pound when it is made to appear to the satisfaction of the President of the United States that the mines of the United States are producing one thousand five hundred tons of cassiterite and bar, block, and pig tin per year. The President shall make known this fact by proclamation, and thereafter said duties shall go into effect.

* * * **Tungsten** ore or concentrates, 45 cents per pound on the metallic tungsten contained therein * * * ferrotungsten, metallic tungsten, tungsten powder, tungstic acid, and all other compounds of tungsten, 60 cents per pound in the tungsten contained therein and 25 per centum ad valorem; ferrochromium tungsten, chromium tungsten, chromium cobalt tungsten, tungsten nickel, and all other alloys of tungsten not specially provided for, 60 cents per pound on the tungsten contained therein and 25 per centum ad valorem.

Zinc-bearing ore of all kinds, containing less than 10 per centum of zinc, shall be admitted free of duty; containing 10 per centum or more of zinc and less than 20 per centum, one-half of 1 cent per pound on the zinc contained therein; containing 20 per centum or more of zinc and less than 25 per centum, 1 cent per pound on the zinc contained therein; containing 25 per centum of zinc, or more, 1½ cents per pound on the zinc contained therein.

Zinc in blocks, pigs, or slabs, and zinc dust, 1¾ cents per pound; in sheets, 2 cents per pound; in sheets coated or plated with nickel or other metal (except gold, silver, or platinum), or solutions, 2¼ cents per pound; old and worn-out, fit only to be remanufactured, 1½ cents per pound.

Zinc oxide and leaded oxides containing not more than 25 per centum of lead, in any form of dry powder, 1¾ cents per pound; ground in or mixed with oil or water, 2¼ cents per pound; lithopone and other combinations or mixtures of zinc sulphide and barium sulphate, 1¾ cents per pound.

Zinc chloride, 1 3/10 cents per pound; zinc sulphate, ⅜ths of 1 cent per pound; and zinc sulphide, 1½ cents per pound.

TAX REFORMS AND THEIR UNJUST TENDENCIES

Revisions of Revenue Laws Pay Little Heed To Principles of Conservation—Discriminatory Levies Composed Upon Minorities In Industrial World—Tax Conference To Study Situation

By McK. W. Kriegh

TAX REFORMS generally have their inception in certain demands which existing systems or methods of taxation cannot satisfy. These demands are widely varied in character. Existing tax laws may fail to yield adequate revenues to meet necessary public expenditures, in which event taxing authorities are compelled to seek new sources of revenue. There may be a widesperad sentiment in favor of tax revision because taxes are unduly high and oppressive. New public projects and expansion of governmental agencies and activities may require additional tax levies. Lack of authority for proper equalization of taxes among different classes of taxpayers or kinds of industries may furnish the reason for tax legislation. Frequently, however, selfish motives inspire proposals which, if adopted, would discriminate against a particular class or industry. Such unsound proposals often receive strong support from the electorate because of misinformation contained in propaganda directed by interests seeking inordinate gain.

An Increasing Agitation

Increased public indebtedness at a time when the basic industries of the country are passing through a period of deflation and retrenchment, has precipitated an increasing agitation for the amendment of state tax laws and changes in methods of state and local taxation. The enormous increase in the bonded or funded debt of states and their political subdivisions from $3,834,000 000 in 1913 to almost $10,000,000,000 in 1921, undoubtedly was predicated upon the theory that the abnormal prosperity existing during the war would continue indefinitely. Apparently, little thought was given by public officials, under whose administrations extraordinary obligations were incurred, to the prospect of acute industrial depression and monetary deflation following the war which would decrease tax revenues and necessitate the seeking of new sources of revenue to meet these obligations. The civil divisions in which these conditions exist are now disturbed by demands for tax reforms, but there seems to be no constructive effort afoot to curtail current disbursements where it is possible by any means to increase current receipts.

Tax controversies have become political issues of vital importance in most of the mining states. Unfortunately, professional agitators and selfish politicians who hope to ingratiate themselves with a majority of the voting populace, are ignoring the principle that additional tax burdens should be spread over all classes of taxpayers alike. Some of their proposals seriously threaten the future welfare of the natural resources industries, which have been selected as the class least able to resist attack. The mining

McK. W. KRIEGH
Chief, Tax Division, American Mining Congress

industry has not escaped the grasping reach of the manipulators of public sentiment who have hypothecated and dissipated public funds by reckless borrowing and extravagant spending when prosperity was abnormal, when costs were high, and when war diverted public attention from domestic issues. This is one of the principal causes for selective mining and the wasteful exploitation of mineral reserves. The investor in a mining enterprise is compelled to adopt methods of operation which best insure recovery of his original investment and a fair rate of profit without regard to principles of conservation.

Rapid Increase of Burden

Notwithstanding the phenomenal growth of the mining industry, tax burdens have outdistanced that growth by alarming proportions. During the ten-year period 1909 to 1919, taxes on mining enterprises became seven times greater than the amount paid at the beginning of the period, although the capital invested in the industry merely doubled. No other industry, as a whole, has suffered such a tremendous proportionate increase in its state and local assessments. Divers methods of valuation are being applied among the states and special forms of taxation, supplementary to the general property tax, have been enacted to accomplish this result. The tendency is to discourage rather than foster mining development with the aid of outside capital, for on every hand the cry of the agitator is heard against the so-called "absentee capitalist," while the fact is ignored that outside capital, staked in hazardous mining ventures, has been responsible for most of the progress and development in agriculture and transportation which has taken place in the mining states.

Permanent Injury Threatened

The general public and state officials must be made to realize that these conditions cannot continue without resulting in serious permanent injury to industrial development as well as impairment of the nation's natural resources. The present situation is replete with instances where mines are being rapidly exhausted, reserves wasted, exploration discontinued, plants closed down, all because mounting costs have made impossible the profitable operation of properties, and have made prohibitive the complete utilization of mineral reserves.

Mr. Albert H. Fay, chief of the Natural Resources Division, Bureau of Internal Revenue, in a recent address to employes of the Treasury Department, stated that "every proposal for taxation of mining properties should be based upon a thorough knowledge of the risk which attends mining investments and the short life of most mining properties." He explained that "in these respects mining is different from any other business in the world, and to this extent it must always be given separate consideration." He further declared that "in a mining community the mine and its equipment are often the only taxable assets. The majority of voters usually own no property other than possibly the house in which they live. They vote for city improvements, schools and highways, re-

gardless of cost. Under these conditions states and counties may easily impose a tax burden upon the mining industry which is wholly disproportionate to that imposed upon taxable resources of other industries." Mr. Fay's statements are in accord with those made recently by one of the tax commissioners of Minnesota, who asserted that the mining districts of that state have a large floating population, of which only a comparatively small number own homes, that local levies are largely responsible for the heavy taxes paid by mining companies, and that the agricultural sections of the state do not levy taxes as high as those levied in the mining districts. These conditions are also apparent in other western states. Representative Thomas A. Chandler, of Oklahoma, during the hearings before the Committee on Ways and Means on tax-exempt securities, said: "I represent one of the greatest mining districts in the United States, and I know that nine-tenths of the mines are shut down because of the fact that they are producers of low-grade ore. Only those with high-grade ore can run at the present time, especially in view of the market conditions."

Tax Conferences Inaugurated

Recognizing the importance of establishing a clearer understanding of the needs of governments and the problems of taxpayers, the American Mining Congress inaugurated the conference on mine taxation which is held annually in conjunction with its annual convention. At these conferences state and federal officials have met with representatives of the mining industry to study problems of mine taxation and discuss methods of eliminating inequalities. The conference of 1921 held at Chicago led to an investigation of state and local taxation systems by a special tax committee, and this investigation is still in progress. The data assembled for the use of this committee discloses many instances of unjust discrimination against the mining industry. However, in the states where the hazardous and speculative conditions surrounding mining investments and operations are recognized by those charged with the administration of tax laws, efforts to secure greater economy and efficiency in the handling of public funds are neutralizing the agitation for tax reforms.

The conference on mine taxation will be held this year at Cleveland, Ohio, during the first three days of the annual convention of the American Mining Congress beginning October 9. The conference will be devoted primarily to the discussion of important questions of federal taxation, concerning which there is much uncertainty and controversy. Depletion dividends, invested capital, value to be used in computing capital stock tax, special relief, settlements, simplification of procedure, accounting methods, and many other subjects will be discussed by speakers and delegates who have figured prominently in the field of mine taxation for many years. State and local taxation will be considered in connection with a proposal to continue the investigation of mine taxation now being conducted by the special committee created last year to study this intricate subject. Representatives of the Bureau of Internal Revenue and Tax Simplification Board and many state tax officials are expected to be present.

The American Mining Congress has made no attempt to deal with local tax problems in particular states, except to review the general situation, believing that local matters should be left entirely to the local chapters of the organization and other local mining associations. The national organization has confined its work on taxation primarily to federal revenue laws and their administration. Long before war-time revenue laws made federal taxes a serious factor to be taken into account by the natural resources industries, the American Mining Congress became sponsor for their recognition as wasting assets so that the investor in a mine, quarry, pit, oil well or timber tract could recover, through depletion allowances, his investment during the operating life of his property, provided sufficient reserves could be developed, just as the manufacturer or builder recovers the cost of his plants or buildings through allowances for depreciation. Thus, the mining industry and other wasting industries have been saved from what manifestly would have been a gross injustice during these recent years of high federal taxes.

Further Efforts Made

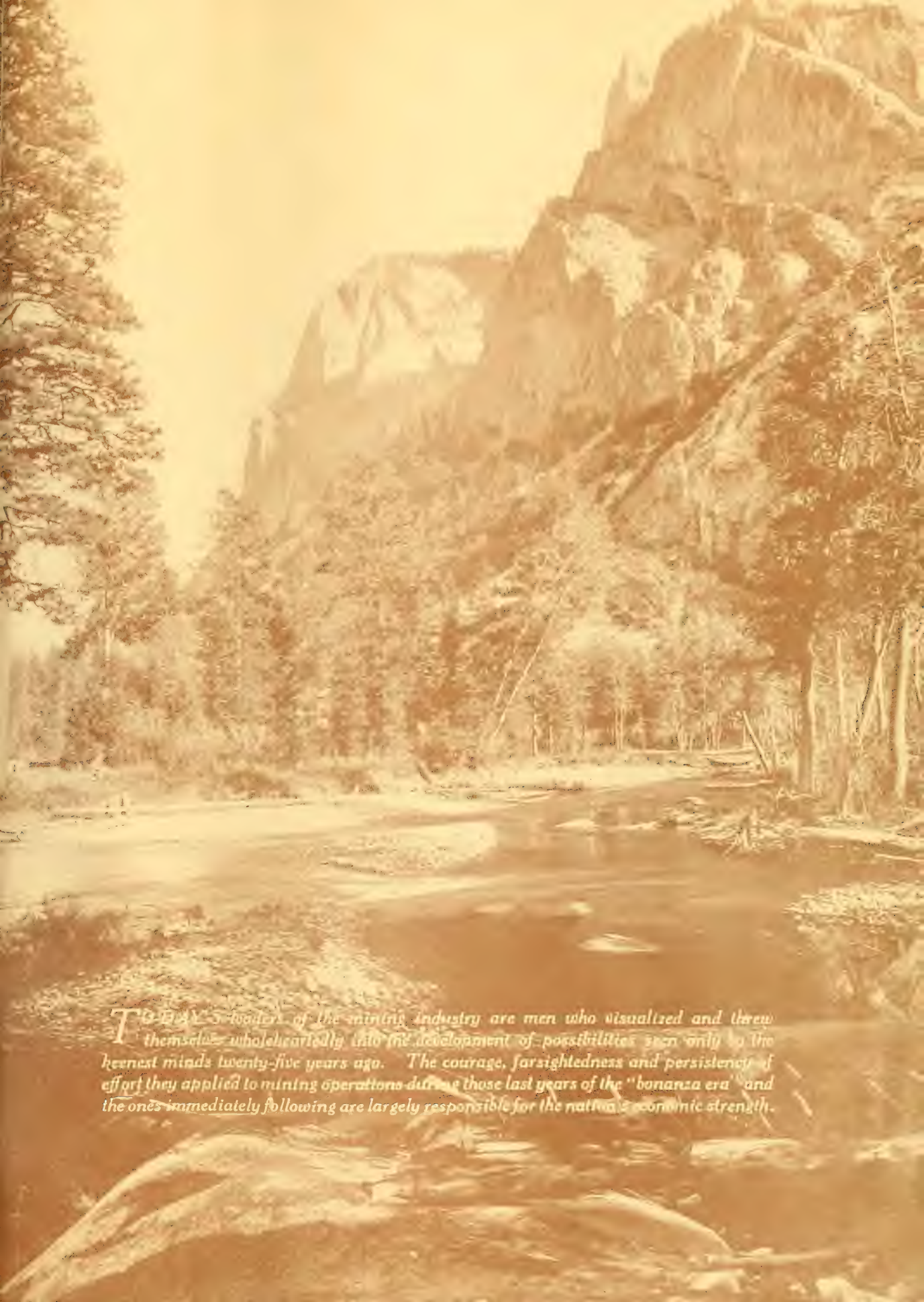
The efforts of the organization did not end with the enactment of this legislation. Recommendations have been urged repeatedly for administrative changes in the government departments which would facilitate the determination of tax liability and secure settlement on a satisfactory basis. Many of these have been approved by the newly-created Tax Simplification Board and put into effect by the Commissioner of Internal Revenue this year, and are aiding materially in the adjustment of claims and controversies. The revenue law of 1921, through the repeal of the excess profits tax, has removed much of the uncertainty and many of the difficulties encountered by taxpayers in the computation of their taxes. However, its provisions furnish many questions which must be carefully studied and analyzed if future litigation with the government and consequent hardship upon taxpayers are to be averted.

Federal taxes are imposed on a uniform basis. Certain principles govern in their administration. The computation of tax liability in all cases is in the hands of a force of specially trained agents or employes of the government. A farmer is not selected to appraise mines. A miner is not assigned to the work of valuing agricultural lands. A cattleman is not required to assess intangibles. A blacksmith is not obliged to interpret tax regulations. A barber is not made responsible for the examination of books of account. A shoemaker is not called upon to make tax determinations. Under state laws, however, these duties frequently are conferred upon elected officials, who follow the private pursuits named, with results that are anything but satisfactory.

Maximum Effort Needed

The tax situation cannot be improved without putting forth a maximum effort. The local tax committees of mining associations are invited to cooperate with the national committees of the American Mining Congress. As it is not the policy of the national committees to interfere in state and local controversies, the local committees should not hesitate to utilize the services and information which have been made available as the result of the investigation of systems of taxation instituted last year. It is not contemplated that any uniform plan or system of taxing mines would be practicable on account of varying conditions in different states; but it is considered important that certain fundamental principles should be recognized by the taxing authorities of every state in the taxation of mines and other natural resources.

One state, by imposing unduly high taxes upon its mines, should not thereby create an advantage in favor of the mines of another state where taxes are on a lower level. No state, by adopting special forms of taxation to supplement its revenues, should discriminate against the mining industry in favor of other industries or impose a burden which will shorten the life of its mines and reduce its mineral reserves. Taxes should be equitably apportioned among the several industries and classes of taxpayers in the state, and an equitable apportionment in those states where high taxes upon mines are causing a depressing effect, undoubtedly would stimulate mining activities and encourage development with the aid of outside capital. A campaign of education, wisely directed, to acquaint the public with the facts, must be undertaken by the local industry in each state in order to counteract the misinformation which is being circulated for political advantage.



TODAY'S leaders of the mining industry are men who visualized and threw themselves wholeheartedly into the development of possibilities seen only by the keenest minds twenty-five years ago. The courage, farsightedness and persistence of effort they applied to mining operations during those last years of the "bonanza era" and the ones immediately following are largely responsible for the nation's economic strength.

"Back in '97"

Charles M. Schwab

John A. Topping

Wm. Boyce Thompson

Elbert H. Gary

Carmi Thompson

George H. Crosby

25 Years Ago

W. J. Loring

E. P. Mathewson

D. C. Jackling

D. W. Brunton

Sidney Jennings

Walter Douglas

"Back in '97"

J.F. Welborn

Norman Bridge

P.H. Penna

R.C. Gemmell

Edwin Ludlow

W.L. Saunders

25 Years Ago

S. Pemberton Hutchinson

H. N. Taylor

Carl Scholz

Samuel A. Taylor

T. H. Walkins

Albert Nason

"Back in '97"

William Loeb, Jr.

A.C. Dinkey

George Wingfield

W.J. Olcott

E.W. Parker

William A. Clark

SEVEN AVENUES INTO THE FUTURE OF MINING

Paths To Be Followed In Pursuit of Successful Rehabilitation of Industry are Well Mapped—Simplification of Relations With Government a Vital Factor

By W. J. Loring
President, American Mining Congress

THE FUTURE of the mining industry of the United States depends very largely upon seven important things, Stabilization of Exchange, Revision of our Tax Laws, Combinations of Capital, Public Education, Intensive development of our Known Mineral Areas, Improvement in Metallurgical Practice and Mining Methods, Cooperation of Employers and Employed.

Mining is no different from other lines of business. It must enjoy a ready market for its production; otherwise it cannot be considered in the light of a commercial business. Given a ready market, mining becomes a commercial business the same as lumber, steel, or wool.

Therefore, if we assume that the product of the mining industry of this and other countries has a ready market, the next question to be considered in the steady road to progress will be the question of exchange with Europe.

Until such stabilization has been effected there will be more or less disappointment in the future of our mining industry and the future of mining generally. Our large copper mines, equipped with most modern machinery, are practically at a stand-still, largely because the exchange rates with Europe are demoralized. As a result, the product from these copper mines is a drug upon the market. While there are sales and indications of revival, it would appear that before we finally arrive at a point where satisfactory results may be obtained, stabilization of exchange must be effected and placed upon a basis where Europe, as well as ourselves, will know within reasonable limits what exchange rates will be for a given period in the future. But it is not the copper mining industry alone that suffers from these deplorable conditions, but other base metals as well.

With the stabilization of exchange Europe will recover from the demoralizing effect of her unstable condition that has prevailed since the war. As soon as she is placed upon a satisfactory basis, our own industries will become more stabilized. It is a pity that this great question has not been solved before the countries involved have drifted into a demoralized state.

Federal tax revision in the United states is absolutely essential. Encouragement by the government in every possible way for combinations of capital to be used in the development of our mineral resources should be given. Unless such combinations are protected and encouraged there is no inducement to develop mineral resources in the United States. One way in which this encouragement may be offered is in a fair rate of taxation.

An analysis of the future of the mining industry indicates that a group of definite needs must be satisfied if full success is to be achieved. Mr. Loring, whose keen observations throughout a long experience entitle him to speak in an authoritative manner, outlines these needs as follows:

Stabilization of exchange.
Revision of our tax laws.
Combinations of capital.
Public education.
Intensive development of our known mineral areas.
Improvement in metallurgical practice and mining methods.
Cooperation of employers and employed.

Instead of looking with suspicion upon combinations of capital, they should be encouraged within restricted bounds, but these restrictions should not be prohibitive. It is not wise for any individual or combination of individual to have free sway in the development of the country's natural resources. Companies should be allowed to do business along reasonable lines under tax regulations that will permit them to live and to develop their properties with some assurance that they will be protected, and that in the end profits will be enjoyed.

Viewed In Wrong Light

Mining is considered to be unsound, unstable and unsatisfactory. It should not be considered any one of the three any more than any other business. Mining in the hands of competent, experienced, honest men, is no more liable to failure than is a shippers' combine, the growing of wool, or any other product that might be named. All of them are more or less dependent upon future conditions that are not possible to foresee. We should attempt to restore confidence in the public mind through the understanding that mining is carried on along strictly commercial lines, and when in the hands of honest and competent men constitutes as sound and safe an investment as any other business.

A mine cannot be developed without someone having taken a chance. A mine is not a mine until an ore body is found, or until its mineral resources have been developed to such an extent that the term "mine" might be applied. In all businesses where the public is expected to contribute money for the purpose of development, every fact should be plainly stated concerning the undertaking. If it is a speculative venture, the public should be told so. If it is a sure thing, it should also be plainly stated. Whatever the actual conditions are, the people who put up the money for development purposes should be taken fully into the confidence of those who are promoting the enterprise. Misrepresentation of actual facts cannot be too severely condemned. Because there is misrepresentation is no reason to assume that the whole industry is at fault. Without capital, experience and those who are prepared to take a chance, the mineral resources of our country never will be developed.

The cost of operating, results obtained, and everything that pertains to active operations of our mining industries, should be freely distributed, so that not only shareholders but the public generally may be educated and understand what each individual undertaking is doing, results obtained, etc. There can be no harm in publicity and the publication of such results—there can be nothing but good resulting from it. It will have a stabilizing effect upon our mining industry. It will quiet the minds of the critics who do not understand the fundamental principles of mining, and surely the mineral wealth of the country can be freely discussed, because it is not in competition with anything else.

By the publication of actual results, and a continuation of publishing such matters freely and in understandable

language, the public will become educated, will support mining more than it does today—labor will follow, in my opinion, by an understanding of what actual results are, and there will generally be less mystery than now surrounds the present and future of our mining industry.

Intensive Development Necessary

Development of our known mineral deposits is the next step to insure the future success of mining. Unlimited encouragement should be given to those who are prepared to search for and develop ore bodies that have been disclosed by geological exposure made in the old and well known mineral sections of our great country. Undoubtedly new fields will be opened up, but the immediate future prosperity of our mining industry should be, in my opinion, counted upon as almost certain in the old and well known mining districts of the world. In some instances too little attention is being given to the old and well known mining sections. After they have been developed and placed in a productive state and operated for years in a highly successful manner, interest wears off and engineers and others who are competent search for new fields, when perhaps under their very eyes are properties that might be developed and largely increased ore bodies found as a result.

A revival of interest in these old sections would largely increase mining operations. The government can aid the revival of mining in the older districts by keeping their geological surveys up to date. They should pay more attention to the recording of tonnages, outputs, plans of operation and actual plans of underground workings, so that when properties are abandoned there will be a government record of all operations that have been made.

Improved Practice a Boon

Improvement in metallurgical methods will greatly assist in the revival of mining. Methods should also be improved. Both of these will be much slower in the future than they have been in the past, because of the great strides already made, but we can confidently look forward to still greater improvement in both metallurgy and methods.

Another important factor in the future of mining is the labor question. Until the workers become contented and educated, more or less strife will result. If the laborer, however, is taken into the confidence of those engaged in mining, much trouble can be averted. Labor as a rule believes that a mining company has unlimited means at its disposal and that economic methods are unnecessary, whereas if the truth were known, in many instances, instead of having unlimited means the company may be going behind and failing to meet its actual expenses. There can be no harm in telling labor exactly what these conditions are. Certainly labor realizes the necessity of combinations of capital in order to develop, equip and operate large mining ventures.

Consolidation of operations under the leadership of men of emperience is also necessary. In my opinion, consolidation of operations under the leadership of men with a great deal of experience is much better than divided leadership in the hands of men who must necessarily be of less importance and with less experience.

REPORT OF CALIFORNIA METAL ASSOCIATION

By Robert I. Kerr, *Secretary-Treasurer*

THE CALIFORNIA metalliferous mining industry has shown some improvement during the past year due to increased activity in gold mining.

The advance figures of the United States Geological Survey for 1921, report an increase of 14.6 percent in the number of metal producers, and an increase in the value of all metals produced of 10.4 percent.

Gold production increased from $14,311,043 in 1920 to $15,704,822 in 1921; silver from $1,859,896 to $3,629,223; copper production declined from 12,626,272 pounds in 1920 to 11,743,404 pounds in 1921; lead from 4,813,510 pounds to 1,124,276 pounds and zinc from 1,165,509 pounds to 1,057,731 pounds.

Increase in Silver Output

The 50 percent increase in silver production is due to recent discoveries in the Randsburg District, Kern County, most of the metal coming from the mines of the California Rand Silver, Incorporated, a member of this association.

Copper production was confined almost exclusively to Plumas County, most of which was mined by the Engels Copper Mining Company, also a member of this association; 90 percent of the lead was produced in the Inyo County and all of the zinc in Shasta County.

The Board of Directors of this association have purposely refrained from action committing the organization respecting its attitude on the Arentz mining bill (H. R. 7736), because of the wide diversity of opinion respecting its provisions, also, because of the opportunity given individual members for expression of opinion, in a questionnaire mailed by the American Mining Congress.

In the matter of the application of the power companies for increased rates for electrical service, an investigation ordered by the Board of Directors has resulted in the filing of a brief with the Railroad Commission by a consulting electrical engineer in behalf of the mining industry. The study and report therein, covering the spread of rates over the different industries involved, is considered a very able presentation of the matter, and indicates justification for a material reduction in mine and dredge power rates.

Through affiliation with the American Mining Congress and cooperation with the various mining organizations of the western states, the association has given its support to federal legislation proposed for the benefit of the industry.

Rendered Valuable Service

The American Mining Congress, the official organization of the industry at Washington, has rendered valuable service to its membership during the past year, particularly in reference to activities respecting proposed tariff legislation.

The organization of a Western Division, as the result of a conference held in Denver, Colorado, on June 20 and 21, has been indorsed by this association by the appointment of President Higgins of the association as California's representative on the Board of Governors. We believe that such an organization will develop larger cooperation among western mining operators and materially assist the national organization in its work.

During the past year conditions have brought about a demand upon the part of both gold and silver operators for both state and federal legislation for the prevention of the practice of "high-grading."

In view of the fact that proposed federal legislation on the subject must necessarily meet with the approval of the U. S. Mint authorities, the matter is receiving due consideration with that idea in view. Proposed bills providing for both state and federal legislation on the subject have been drafted and are now under consideration.

Labor conditions in mining districts throughout the state are again becoming the subject of serious concern. A shortage of all classes of labor is daily reported. Conditions may improve when the fruit crop is harvested and sawmill operations suspend for the winter season; however,, the resumption of operations by the copper mining companies would absorb more men than are thus released.

Indications point to the fact that the time has arrived when legislation passed immediately following the war, placing restrictions upon immigration, should be repealed.

This association was again honored at the Chicago convention by the reelection of its Vice-President, Wm. J. Loring, to the presidency of the Congress for another year.

THE FUTURE OF THE SILVER MINING INDUSTRY

By Sidney J. Jennings
Vice-President, U. S. Smelting, Refining, Mining and Exploration Company

THESE NOTES which aim to set forth certain considerations on which the immediate future of silver is dependent are necessarily prefaced by that little word if" which takes the sting out of the role of prophet.

The publications of the different bureaus of the United States Government contain the greatest amount and the most accurate statistics concerning silver that are available. Even these reports leave many questions concerning the present condition of silver unsolved because the information is not procurable, and when procurable is not always in such form as can be utilized. Any prediction as to the future of silver is dependent upon the present position of that metal and as the knowledge of the present position is based on incomplete statistics and the unknown psychology of nations, prediction as to the future of silver is peculiarly liable to error.

The operation of the Pittman act will continue to maintain the price of silver produced in the United States at 99⅝ cents per fine ounce at New York.

Operation Under Pittman Act

The Director of the Mint reports that the total amount of silver to be repurchased from American producers under the Pittman act is 208,000,000 ounces. Purchases were started in the latter part of May, 1920, and up to the latest date available (July 22, 1922) a total of 119,848,506 fine ounces had been purchased, leaving 88,151,494 fine ounces still to be purchased. At the average rate at which silver has been purchased during the past twenty-seven months, it would take about nineteen months to complete the purchase under the Pittman Act. Owing to the increased production due to the starting up of the copper smelters, it is probable that this figure may be reduced by two or possibly three months. This would bring the completion of the purchases under the act by January 1, 1924, or December 1, 1923. It is, however, entirely reasonable to assume that the smelting companies which purchase silver in ores produced in the United States will give notice, probably six months before that time, to their customers that they will make a provisional settlement for silver, on the basis of the foreign price for silver, paying the miners the balance when received from the mint. It will be necessary for purchasers of silver in ore to arrange with the mint some fair method of cut off so that the proper and fair proportion of the available purchasing power at a dollar an ounce can be allocated between the miners who produce silver in ores sold to a smelter, which takes from four to six months to get to the mint, and the miner who produces his silver in cyanide bullion, which gets to the mint in a short time, not to exceed one month, after the ore is produced.

Nations merely are human beings magnified in proportion to the number of their citizens. As individuals, they move and act in accordance with the direction of their thoughts. Their thoughts are molded like those of single beings, by all the factors governing mental processes.

When consideration of any subject enters into an international viewpoint, close regard must be given to the psychology of nations and the probable trend of actions dictated by their mass mentalities.

The future of silver hinges upon the quirks of these national minds. Even the task of outlining the situation upon which action will be taken is rendered difficult through the absence of statistics covering production and consumption of silver throughout the world.

But the struggle of economic forces to adjust themselves involves the silver industry in a vital way and every possible thought on the subject must be developed.

A World-Wide Price

From this survey it seems probable that on or before January 1, 1924, there will be only one price for silver in the world. The question then arises as to what will happen to that price when the total production of the United States, which has been taken care of by the Pittman act will be thrown upon the open market.

The production of silver in the United States has declined steadily from the 74,961,075 fine ounces produced in 1915 to the 53,727,891 produced in 1921. In spite of the encouragement of the high prices in 1919 and 1920 and the guaranteed price of 1921, production did not increase in any one of those years. It is therefore reasonable to assume that when the stimulus of a guaranteed price is removed, the production will tend to diminish. There are no new metallurgical processes, known to me, the use of which will permit of the mining of a lower grade ore at a profit. I therefore look forward to a drop in the output of silver from the United States after the effect of the resumption of copper smelting has been allowed for.

Output During Next Two Years

While there is some increased activity in silver mining in Mexico, which is the largest silver producer, there does not seem to be sufficient to markedly increase the output of the world when the conditions of silver mines in Canada and Peru, which are the other large producers, are taken into account. It seems probable that the output of silver for the next couple of years will be somewhere between 165,000,000 and 170,000,000 fine ounces. During the past twenty-seven months when the United States Government bought the production of the United States, amounting in round figures to 119,000,000 ounces, the world utilized a very large amount of silver derived from the remelting of coin and silverware in the European countries. The following table derived from the report of the Director of the Mint shows the fine ounces of silver consumed by the nations in making silver coins since 1915 and also the world production of silver.

Year	Fine ounces of silver consumed in coinage	Fine ounces of silver produced
1915	225,116,911	178,896,314
1916	292,148,559	161,177,900
1917	286,596,805	174,187,800
1918	238,692,502	198,168,408
1919	298,300,518	176,409,604
1920	216,340,590*	168,655,387
1921		164,647,166†

*There appears to be an error in reporting the amount of silver coined by Great Britain which would reduce this figure by 79,682,046.

†Estimated by the American Bureau of Metal Statistics. There are no available statistics for the world of the amount of new silver used in coinage. The above figures therefore merely indicate that up to a very recent date a very large amount of silver was used in coinage but does not give the source from whence this silver was derived. It is evident that probably the bulk of it was derived from recoinage.

No World Figures Available

There are also no statistics available for the world of the amount of new silver consumed in the arts. The following table shows the amount consumed in the United States according to the report of the Director of the Mint.

Year	Fine ounces of new silver consumed in the industrial arts
1916	22,201,261
1918	26,722,383
1919	26,237,519
1920	19,280,129

These figures indicate the possibilities

of the demand for silver in the industrial arts.

India imports an excess of silver over the amount she exports. The following table gives the figure for recent years:

Year	Excess of imports in fine ounces
1918	180,454,641
1919	170,849,051
1920	3,663,012
1921	55,919,954

These figures indicate that there was a very normal excess of imports in the calendar years 1918 and 1919 and a very small excess in 1920, whereas 1921 returned almost to normal. The figures so far available for 1922 indicate that the excess imports are at the rate of 90,000,000 fine ounces. The visible stocks of silver in India were 150,100,000 fine ounces on January 1, 1920, and were fairly steadily increased until on June 22, 1922, they amounted to 271,150,000 fine ounces. It is of course impossible to make even a guess at the amount of the hoarded stock.

China's Silver Accumulation

China's importation of silver is second in importance only to that of India. The figures available are not so complete as those for India. The stocks of silver in Shanghai have increased from 32,335,800 fine ounces on January 1, 1920, to 56,883,500 fine ounces on June 24, 1922.

Both India and China have been accumulating silver and have not been consuming it. One of the problems in the future of silver is to estimate the capacity of India and China to continue their accumulation of silver.

The countries of Central Europe have been experimenting with various forms of token coinage and paper currency. It begins to look as if some of them were getting tired of such substitutes. History has shown that no device so far prepared by man is sufficiently strong to curb his greed when once embarked on the sea of paper currency. Sound currency must be based on some metal, the value of which can not arbitrarily be varied. The peoples of Central Europe are gradually realizing that they must have sound currency if they are to have permanent prosperity. When they reach the stage of the Mexican workmen who refused to work unless their wages were paid in metallic currency, the foundations for the restoration of prosperity will have been laid. In any return to metallic currency silver will play an important part.

Sizing up all these cross currents, it seems to me probable that even when the operation of the Pittman act ceases to have an effect and the production of the United States is thrown on the world market the price for silver will not materially change from the present price for foreign silver and may quite well be materially higher.

COAL EXPORT COMMITTEE REPORT

THE WORK of the Coal Export Committee the past year has been necessarily perfunctory. Shipping conditions, demoralized foreign exchange, English competition and the domestic coal and railroad strikes have combined to reduce exportation of coal to a minimum.

In 1921 34,423,000 tons were exported. The estimated exportation for 1922 is 13,035,000 tons.

Outlook is not Bright

The outlook for 1923 is not bright. Reserve supplies of bituminous coal are practically exhausted. The labor problem in the coal industry is still unsettled; the recent action being simply an industrial anesthetic which must ultimately wear off. There will undoubtedly be a tendency on the part of large consumers of coal to prepare for next year's supply before entering into export. For the first time in many years, considerable quantities of coal have been imported into the United States.

On September 1, 1921, a total of 65 Shipping Board steamers had been chartered by the Fleet Corporation to import coal from Wales and the East Coast of England. Approximately one million tons had been bought on this date, from British shippers, part of which is moving in British bottoms.

Economists have long considered that South American business belongs to the United States. It was anticipated that through the United States Shipping Board American coal might be a factor in the Mediterranean trade. The results, however, of Shipping Board attempts to carry out this policy, do not make it look propitious to attempt to establish lines in rivalry with the British.

The restrictions under the LaFollette bill seem to increase the difficulties of profitable shipping in American bottoms. Nevertheless, there remain Canada, the West Indies and a portion of the South American business.

A Basic Requirement

One of the basic requirements of an international trade is the establishment of recognized standards of quality and preparation, and such a system of inspection as will guarantee reasonable uniformity of cargoes under these standards.

The upward movement in Sterling exchange is due largely to the importation of British coal on which prices are quoted in Sterling. Coal is sold in large quantities and customers ordinarily stick for a long period of time. The coal and railroad strikes in the United States, to which reference has been previously made, have smashed customer-relationship, and established new buying habits. The effect is undesirable and will bear importantly on the future of the industry.

Much of the information service previously conducted through this Committee by necessity, is now ably carried on by the Department of Commerce. It is the consensus of opinion that the foreign exchange situation will ultimately right itself, so far as the principal European countries furnishing substantial markets are concerned.

It would be interesting to follow the history of what actually has happened to our coal trade as a result of the strike disturbance, and to find out what countries of our foreign customers have been buying from Great Britain or elsewhere. The information so obtained would be of value in future export sales campaigns.

While foreign credit is bad, until the strike occurred, we were exporting coal. It is a requirement which must be supplied, if not from one source, then from another.

Most of the plans of national size for financing export coal have failed or repose in the discard. This includes the Foreign Trade Financing Corporation, the Vanderlip Plan, the Hitchcock Plan, the Owen Plan and that of the American Importers' and Exporters' Association.

Money is the Thing

All of these plans appeared to be feasible, but none of them went beyond providing efficient machinery for something, viz: foreign securities, which cannot be sold on anything like an adequate scale until the people of this country generally are themselves sold on the importance of foreign trade itself to the country, and next upon the advisability of investing in foreign securities of any kind.

Before any of these plans can be put in operation, somebody must dig into his savings and find the money to pay the bill. Routing goods through any number of interesting and efficient processes will not serve, until somebody finds the money.

This is the real crux of the situation as affecting coal export, not just at present when we have no coal for export, but later, when conditions approximating normality have been reached.

Henry Mace Payne,
Chairman.
Geo. A. O'Reilly,
John Callahan,
Charles A. Owen,
Geo. S. Rice.

THE FUTURE OF THE GOLD MINING INDUSTRY

By Bruce C. Yates

Superintendent, Homestake Mining Company

NOW THAT the disturbing effect of the late unpleasantness is subsiding, we should be able to take a sane and unprejudiced view of our great gold industry. There has been a great deal of loose talk about the future of the industry. The assertion has been made that unless something is done, and that quickly, gold production will cease. Whether we take this extreme view of the situation or not, those of us directly interested in the mining of gold know that the industry has passed through a period of great depression from which it has not fully recovered, but most of us feel confident that it is neither dead or dying.

There was a time in the near past when gold mining needed extraordinary assistance from the government. The assistance was not given and the gold miner feels aggrieved because the silver miner and the farmer received government aid while he was left to sink or swim. Whether the industry will be stronger in the future because it has had to stand alone, only time will tell. Not all of the boys who were thrown into the old swimming hole and told to swim or drown learned to be good swimmers. Likewise not all of the gold mines have or will weather the industrial storm, but those that do will have learned lessons of economy not soon forgotten.

Endowed With Hardy Spirit

The gold miner comes of hardy stock. He is the decendent of the pioneer of '49 who, carrying his grubstake on his back trudged his weary way across a continent to the Eldorado of the Pacific, and later braved the snow and ice of Alaska for the gold of her streams. The spirit of these men still lives and the optimism and undaunted courage which is a part of the heritage left us by them will push us out into lands still untouched by the prospector's pick. The far north of our own North America, Mexico, Central America, South America, Africa and Siberia hold the possibilities of great reward for the prospector and miner of gold. We are not justified in assuming, as some eminent mining authorities have done, that practically all gold producing fields have been discovered, and that the day of the prospector is over, excepting possibly in Alaska. The prospector, be he an individual of the old type or a young engineer representing capital interests, is not going to be content with this assumption while there are still large areas of mother earth that have hardly felt the tread of a man's foot.

During the past few years the reward for labor in the industrial field has been easy of attainment, and, in consequence, the mining field, with its element of chance, has been somewhat neglected. As conditions throughout the world become normal the mining industry will get its full share of the brain and brawn and it is safe to predict another period of growth for the industry and gold mining will share in the general prosperity.

The Perfection of Processes

Aside from the question of new discoveries, there are in this and other countries many deposits of low grade ore awaiting the application of more advanced metallurgical treatment and more business-like methods in mining and administration. During the near past great strides were made in metallurgical processes for the extraction of gold from its ores. The men whose brains brought forth the processes and perfected their application have lived their alloted period of constructive thinking and have gone to their reward or are resting from their labors. This seems to be a period of rest in the metallurgical field, but it must not be taken for granted that the metallurgy of gold has reached a stage of perfection. New processes will be discovered and old ones perfected that will make it practical to work many gold deposits now considered of two low grade to mine and treat with profit. Capital will be attracted to them as opportunities in other fields become more limited.

BRUCE C. YATES

The application of business methods in the operation of many small deposits will turn failure into success and add materially to our gold production. Many gold mines have lain idle for years after discovery until someone came along to apply scientific and business methods in their operation; then we wonder why these mines were not successful before.

As given by the Director of the Mint, the production of gold in the United States during 1921 was 2,422,006 ozs. less than 50 percent of the amount produced in 1915, the peak year, but it is only about 2 percent less than was produced in 1920. Indications say that more gold will be produced in 1922 than in 1921. We may therefore properly assume that the low point has been reached and that the gold industry is trending slowly upward in common with other industries.

The Economic Phase

Perhaps some of our earnest advocates of printing press money will say why produce more gold, we have too much now; and in the face of the vast amount now held in the Treasury of the United States, the gold miner may wonder whether he will find a market for his gold. Gold has always represented wealth whether held as treasure in the coffers of kings or as bullion in the vaults of nations, so we need not worry about a market. The world needs it, though our own country seems to be well supplied at this time. During the war this nation was placed in a very favorable financial position, supplying the world with food and munitions of war, receiving therefor the world's gold. This condition will change when Europe's factories again get under way and then the United States will need all the new gold produced within her borders.

The credit of Europe has been shaken to the very foundation so that it becomes increasingly difficult for her people to purchase goods to supply their industrial needs. Nations may carry on trade with one another by exchange of goods, but there is always a balance on the side of the more favored that must be taken care of by cash payment in some form. Those interested in the commerce between nations scrutinize closely the credit of the purchaser whether a nation or an individual, and it is comforting to say the least to know that the

government of a people with whom we trade has a good sized gold reserve to back up its credit. When we realize more universally that government is not an abstract something, able to conjure wealth from the sky, we will better grasp the underlying principles of our commerce.

A Great Blessing

It would be a great blessing to our own people and to the people of the whole world if our legislators could recognize the impracticability of the schemes presented by some of the so-called monetary experts and honestly endeavor to so shape our financial policy along sound lines that under the severest stress of whatever adverse condition may arise—be it war or famine—this land of ours may weather the storm with credit unimpaired. Should the time ever come when the actions of all men are governed by the golden rule or should conditions under which we live revert to that state of simplicity symbolized by the story of Adam and Eve in the Garden of Eden, then and not till then will gold become of no value.

What the gold industry needs today is not direct financial assistance, but the recognition by our law makers of the hazardous nature of the business and of the fact that the gold miner is not a thief to be watched, but a plain American citizen engaged in the useful occupation of recovering a valuable metal from the ground. The gold miner should receive encouragement through a revision of our mining laws relating to locating and holding mining ground. Why should a citizen of the United States be suspected of ulterior motives because he is willing to enter upon the public domain and spend his time and money developing a deposit of ore simply because it does not show on the surface?

Better Methods Needed

More just and equitable methods of taxing mines should be devised. A mine is not a farm which can be made to produce indefinitely, but is a wasting asset. When the ore is removed the mine becomes worthless and the surface improvements used in connection with the mining operations become worthless. Such surface improvements should not be considered as taxable property, but only taken into account in determining the value of the ore deposit. Some of our State Tax Commissions seem to be governed in the valuation of mines by a theory that because a mine is short lived they should collect all the taxes possible while the "getting is good."

In spite of the present period of depression, antiquated mining laws and unjust tax burdens, the gold mining industry is still vigorous and we can safely predict a bright future for it.

THE SULPHUR INDUSTRY'S FUTURE

By Raymond F. Bacon

Approximately 80 percent of the world's supply of sulphur is produced by three American companies: Union Sulphur Company, Freeport Sulphur Company, and the Texas Gulf Sulphur Company. All three are very large producers with large stocks of mined sulphur on hand and substantial ore reserves.

The only other production of importance is by Sicily, which can only compete in quantity in the world's markets when subsidized by the Italian Government, and by Japan, whose production can be sold only at points where transportation gives it an advantage over the American producers.

The present world consumption of sulphur is roughly one and a half million tons per year, of which the United States and Canada consume one million tons.

Present World Consumption

The United States consumption of sulphur has more than doubled in the last five years, largely due to replacement of pyrites for sulphuric acid manufacture, and this rate of increase may be maintained in the next five years if other important new tonnage uses for sulphur become a factor in the market. Normal increase due to old industries using sulphur is probably about 10 percent per year; and one cannot expect, with prohibition in effect in America, that the spraying and dusting of grape vines in Europe will maintain that ratio. As against normal increase in that market, better financial conditions in Europe affecting the rubber, paper and similar markets, or a revivification of Russia could easily add one hundred thousand tons to the European consumption. Russia, when again active commercially, will probably use a large amount of paper, and hence of sulphur. There is also a tendency in Europe for sulphur to replace part of the pyrites for sulphuric acid manufacture, especially for high-grade or arsenic-free acid.

Spraying and dusting with sulphur is liable to increase very materially in this country; in fact, one of the large promising fields of new uses for sulphur is along agricultural lines.

Sulphur, either in the form of elemental sulphur, or as carbon bisulphide seems to be the best material to use for the control of nematodes—those eel-like worms which are causing such devastation to the roots of various crops in the south and southwest.

Several other lines involving the use of sulphur in agriculture are under investigation in the United States Experiment Stations with apparently promising results. Calculation has shown that if the United States would use sulphur only in those cases in which it has been proved conclusively that it is commercially advantageous to utilize it, as for example, for potato scab and for alfalfa on certain types of soils, the amount of sulphur required would be considerably more than the world's present total consumption. Of course, no one expects that this will happen within five years, as the introduction of new fertilizers, however meritorious, is a slow process, and no nation uses as much fertilizer as it could to advantage, but it is my opinion that there will, within the next five years, be an important tonnage use of sulphur as a fertilizer.

New uses, based on these properties, are constantly being developed, as the sulphur companies are maintaining a very aggressive competitive attitude. Acid-proof and seawater-proof cements have been developed from sulphur, as well as certain new types of heat insulating materials. Commercial utilization of these products will add a large additional tonnage to the world's markets for sulphur.

Lowest Price in Highway

The price of sulphur—approximately $14 per long ton at the mines—is the lowest it has ever been in the history of the industry. This is due to the severe competition existing between the three American companies. At present prices, Sicily, which once supplied the sulphur of the world, has ceased to be a real factor in the market, except as a government subsidized industry.

The chances of discovering new sulphur deposits of profitable character are rather remote. Several very large deposits of sulphur are known, but these are the reserves for future generations when transportation from such localities will be more feasible. In fact, sulphur deposits are so extensive that it is believed the sulphur ores of the world will not be exhausted when the iron ores of the United States are gone. Because of such large deposits too remote from markets, no just criticism can be made that the contemporary sulphur companies are robbing the storehouses of the future.

Sulphur mining is an industry in which large tonnage production is absolutely essential to profitable operation; consequently the sulphur companies have reduced their prices to a point that would create sufficient market to insure such large tonnage operation. The chances for the future are that the markets for sulphur will become wider and wider, and it is my opinion that prices of the product will probably tend upward rather than downward. On the whole, the outlook is bright, and America will for many years to come dominate the world's sulphur industry.

THE DOMESTIC MANGANESE INDUSTRY'S FUTURE

By Chas. W. Potts
Potts Exploration Company

THAT THE SAME vigor and intelligence will be displayed in the development of the manganese industry that has been displayed in the fight for a tariff upon manganese is generally conceded.

A Steady Development

Development in the future will not be sporadic as it has been in the past, but will be well organized and well directed. It may be a little slow in getting started due to caution, but it is apparent that production will tie in well with the exhaustion of accumulation of foreign manganese ores which, it is estimated, are sufficient to last throughout 1923.

At this writing (September 10), with the exception of the manganiferous iron ore producers, miners of manganese bearing ores are marking time. Even among the manganiferous ore producers, activity is almost wholly confined to those properties that can be cheaply operated—the open pit mines.

Most of those who will produce high-grade domestic ore are not inclined at this time to make public their plans for development and operation. Engineers are busy in the South and West working out plans for reopening the mines and producing on a large scale. The erection of large centrally located plants in manganese districts, and of smaller plants in isolated districts, to beneficiate the various types of ore are being given careful consideration. The aim of the producers is to furnish a large dependable tonnage of uniform grades, both as to chemical content and physical structure.

Unique plans of mining and concentration are being given careful consideration by various companies. Not all of the properties that were operated during the war period are likely to be reopened, for, with the advantage of the tariff, there are many small properties that cannot be commercially operated. Under the benefit of the tariff, the price of manganese ore will be only about 50 percent of the prices established by the government during the war.

The producers are confident, however, that there are ample workable deposits to furnish the entire steel requirements for many years.

A New Domination

A different class of people now dominate the manganese industry. Those now financially interested, can no longer be classed as greenhorns, as they have been characterized by certain well-known writers in the pre-war period. The war emergency persuaded men of a different type—men of means, experience and ability to go into this new industry.

Extensive plans are now being considered in certain western districts for the preparation of manganese carbonate ores for blast furnace use. There are undisputed large reserves of ore of this

CHAS. W. POTTS

class in a number of districts in the western states. It is generally conceded that these ores will contribute a substantial tonnage of the manganese required for steel making in the future.

The development of the manganiferous iron ore deposits are not being delayed to the same extent as that of the high-grade manganese deposits. On the Cuyuna Range in Minnesota and the Boston Hill district of New Mexico there is much activity. The producers of these ores are enlarging their production capacity by additional stripping of surface from over the ores bodies, the building and reconstruction of plants for the beneficiation of their ores by washing and dehydration.

The *Engineering and Mining Journal. Press* recently printed the following sententious paragraph:

"A series of blast furnace tests on the manganiferous iron ores of the Cuyuna Range will be run in the near future. These tests are the most pretentious ever undertaken and are expected to have an important bearing on smelting practice as applied to the low-grade manganiferous ores."

The "Hibbard Report," prepared by Henry D. Hibbard, now of the Bureau of Standards and other government investigators for the assistance and guidance of the steel manufacturers during the war, pointed out the desirability of using high manganese pig iron as a source of manganese in steel making. This practice is desirable for making one-half to three-quarters of steel annually produced. Domestic manganiferous iron ores is conceded to exist in sufficient quantities to probably outlast the known crude high-grade iron ore deposits in the districts from which the present supply is now being furnished. The high manganese pig iron practice has many able supporters among steel makers, and is regarded by them as an advancement in steel making.

A Renewed Interest

There is a renewed interest being taken by merchant blast furnaces formerly engaged in the manufacture of ferro-manganese. Some furnaces are now investigating domestic reserves of manganese for the first time and have expressed surprise at the reserves that were disclosed during the war period.

Most of those who produced manganese during the war period, did so under government assurance of a market protected by embargoes. These embargoes, however, were not enforced even during the war period, and after the signing of the armistice, contrary to the promises that had been made to the manganese producers, the embargoes were officially raised. The manganese producers, as a result of their activity under government stimulation, suffered losses running into millions of dollars. Some of these losses have since been partially refunded by the War Minerals Relief Commission, but none has received reimbursement comparable to their losses.

Dates Back Six Years

The history of the real development of the American manganese industry dates back to but six years ago. Before the war period, anyone was regarded as foolhardy who entertained hopes of commercially producing domestic manganese under American labor and transportation costs, and successfully competing with foreign ores produced by pauper labor of Russia, India, Brazil or China. The fight for the existence of this American industry came to a climax on the night of June 5, 1922, when the United States

Senate, by a vote of 35 to 19, announced the adoption of a tariff on manganese ore importation. The House had previously adopted the same rate of protection to this industry, and with the signing by the President of the United States of the Fordney-McCumber Bill, manganese operators will spend the necessary money for the development of their properties and the building of beneficiation plants.

The success of the manganese tariff, against heavy opposition, is largely a result of underestimating the personnel and the force of the men now engaged in the manganese industry.

The annual requirement of manganese for the steel industry on an assumed annual production of forty million tons of steel is 800,000 tons of 45 percent manganese or its equivalent of manganese units in other grades of ore. Of this amount one-half will be consumed in the form of high manganese pig under modern furnace practice. To supply the 400,000 tons of equivalent 45 percent manganese will require 2,500,000 tons of maganiferous iron ore per year, averaging ten percent manganese.

THE TOTAL RESERVES

The recent investigations of domestic reserves of high grade manganese ore show a total of more than 25,000,000 tons, based on 45 percent manganese content, distributed as follows:

	Tons
Alabama	55,000
Arizona	326,000
Arkansas	4,152,000
California	160,275
Colorado	270,859
Georgia	300,000
Montana	8,479,216
Nevada	201,000
New Mexico	201,500
Oregon	16,000
Tennessee	121,000
Utah	15,000
Virginia	11,114,357
Washington	500
Total	25,411,707

Reserves of known domestic manganiferous iron ore ranging in manganese content 10 percent to thirty-five percent, which have been reported and checked to July 1, 1922, are distributed in the various states as follows:

	Tons
Alabama	2,000,000
Arizona	4,107,110
Arkansas	3,859,500
California	60,000
Colorado	2,772,000
Georgia	480,000
Michigan	7,000,000
Minnesota	40,178,510
Montana	227,492
Nevada	1,052,000
New Mexico	2,824,000
Oregon	1,978,000
Tennessee	65,000
Utah	4,000
Virginia	8,406,000

The development of the manganese industry under war necessity will in no way compare with the development of this industry under the stabilizing influence of the protective tariff. Development will now be substantial, permanent and constructive. Manganese operators will have the assurance of a protected market for a number of years. Instead of the hazards of a fluctuating market, producers will be able to plan their operations on a permanent basis with true engineering efficiency.

MUCH MONEY SPENT

In the aggregate, much money has been spent in developing manganese mines in many parts of the United States, but the expenditure of a much larger amount is required to place the properties in a position to furnish the tonnage and grade of ore required to insure the needs of the steel industry. Those who are familiar with the various deposits of domestic manganese ore, and know the character of the men now backing this industry, have no fear that the American deposits cannot supply at least the major part of the manganese required for steel production.

There will be no recession from the position of this industry, won in the tariff fight. There are many problems yet to be met but the manganese people expect to meet them.

There is no doubt that the manganese producers will build up a permanent industry which will compare most favorably with the other great mineral industries of the United States.

DEPLETION RULING ISSUED

THE FOLLOWING ruling on depletion has been made by the Solicitor of Internal Revenue:

Since there is no ownership of oil or gas in place, the provisions of the Revenue Act of 1916 can not be construed to limit the deduction for the actual reduction in flow and production to fee owners, but must be construed to allow the deduction to the taxpayers who sustain the loss, whether lessors, lessees, or both.

Where the interest of a lessee in oil and gas is substantially the same interest which his lessor previously had therein, the provisions contained in the Revenue Act of 1916 for determining the deduction in the case of oil and gas wells must be applied in determining the deduction in the case of lessees, and where oil and gas leases were acquired by purchase or otherwise prior to March 1, 1913, the lessee is entitled to a reasonable allowance for the actual reduction in flow and production based upon the fair market value of his interest in the property as of that date.

POLITICS NOT YET SOLVENT FOR ECONOMICS

By HARRY N. TAYLOR,

Vice-President, Central Coal and Coke Co.

THE GREAT NATIONAL coal strike in the bituminous coal industry is over. The mines in all districts have returned to work, where it was possible to re-open them.

Many mines are still cleaning roads of fallen rock, or are being pumped out prior to cleaning up. Tonnage is again flowing freely to the market.

Even in the crippled condition of the mines, the production is ample for the immediate wants. The public has lost interest in the strike now that the settlement is a reality, and is again withholding orders. Not so with our Senators and Congressmen. They do not seem to know that the war is over, and we are being swamped with regulatory measures of all kinds, all of which add to the load and costs, and hamper the return of the coal industry to normal conditions.

Judging from some of the bills introduced in Congress, there are a number of national legislators who evidently are convinced that the best way to take government out of private business is to eliminate all private business.

There is no legal patent medicine that will cure economic ills, and the functions of government do not include operations of private business. Politics is not yet a good solvent of economics. If Congress will confine its revision of laws to making labor organizations legally responsible for their acts, to a closer study of immigration laws, to laws making individuals who use labor organizations to further conspiracy against public welware personally responsible for their criminal acts, they will perform real service in the public interest and come far nearer fulfilling the duties expected of them than by the passage of regulatory laws, which only serve the purpose of bringing certain Senators and Congressmen into the temporary limelight during the pre-election period.

BRICK KILN TESTS

DURING the past year, the laboratory car "Holmes" of the Bureau of Mines, in cooperation with the four heavy clay associations, has conducted kiln tests at twelve representative brick and tile plants throughout the Middle West. The studies had the three-fold purpose of reducing the amount of fuel burned, shortening the time necessary for burning brick and improving the quality of the ware. Possible savings of thirty per cent in fuel and time have been indicated at some plants.

UTAH COPPER MINE, BINGHAM, UTAH,

when it was operated by underground method. The entire space of this mountain has since been removed by steam shovel operation

PLACER MINING IN LAST CHANCE GULCH (MONTANA) IN 1887

Hill Park, named after the late James J. Hill, founder of the Great Northern System, occupies the ground where piles of tailings were were left by the mining operations

VIEW OF TRINIDAD, COLORADO,

as that city, now the center of the Colorado and New Mexico coal mining region appeared in 1881

THE FUTURE OF ANTHRACITE COAL

By S. D. Warriner
President, Lehigh Coal and Navigation Co.

FOR MORE than three score years and ten the production of anthracite has followed a line closely parallel to that of the increase in population of the United States. The reason for this is simple. Anthracite is primarily a domestic, not an industrial fuel, and the industry has not participated, as has bituminous coal, in the remarkable progress of this country as an industrial nation, except as manufacturing industries have added domestic consumers in the principal anthracite-consuming territory, the New England and Middle Atlantic States.

A Modern Development

Contrary to the general impression, what was commonly known as the "steam sizes," comprising approximately 30 percent of the total production, are not in the main manufacturing fuels, though some quantities are used as boiler fuel in manufacturing plants and by transportation companies. The chief users of the steam sizes of anthracite are the large hotels, apartment houses, and office buildings in the metropolitan cities of the Atlantic seaboard, where smoke-laden atmospheres are unknown except in times of idleness in the anthracite region such as we have recently experienced. Anthracite, whether in the "domestic" or "steam" sizes is not an economical fuel for high pressure steam, when compared with fair qualities of bituminious coal at approximately equal cost per ton, but for low-pressure steam such as is required for heating purposes, it has no superior. Its claim, justly made, for preference lies in its cleanliness, its long sustained fire and in its absolute freedom from smoke and soot no matter in what kind of apparatus it is consumed.

A Constantly Increasing Cost

Had it not been for the development of the means of utilizing the "steam" sizes, it is doubtful if anthracite could have been continued as it has in use as a domestic fuel among the less favored by fortune in communities distant from the producing centers in northeastern Pennsylvania. Natural conditions over which the anthracite producing companies, nor even the United Mine Workers of America, have no control have ordained that from a certain date which may be placed at about the beginning of the present century, anthracite could be recovered only at a constantly increasing cost. This entirely apart from any increasing demands of labor, or the higher cost of timbering and other supplies. Nature is to a certain extent demanding retribution for some of the wasteful methods formerly employed in the extraction and utilization of anthracite. The present and future generations must pay the penalty. The bonanza beds of the anthracite region are steadily, almost rapidly, approaching exhaustion and as recourse has to be taken to the deeper, thinner, and less desirable (from a standpoint of purity) beds, the cost of production and of preparation must of necessity be on an ascending scale, no matter what human ingenuity and skill may accomplish in machinery and methods designed for greater economy in the operation of the mines and breakers.

The outlook for the future of the anthracite industry is not of roseate hue. Production has already reached its maximum. The industry may be said to have reached the prime of life after something more than a century of existence, and as in the case of life in the animal and vegetable kingdoms, having reached its prime, the time when the inevitable period of decline must begin cannot be far distant. That date may be reached by the time the American Mining Congress completes its second quarter of a century of usefulness. No one can predict this definitely. One thing is sure, however, and that is if the period of decadence is to be postponed, and if the industry is to continue for "a breath's space of time" to serve the public efficiently and satisfactorily, other reforms than those of improved methods of mining and preparation must be developed. Through greater economies in the utilization of anthracite by the domestic consumer more efficiency must be secured. Much can be accomplished through the elevation of the now disregarded steam sizes to a status approaching equality with the domestic sizes. Hotels, apartments, office buildings and other large consumers can use bituminous coal with smoke preventing appliances that will meet the requirements of the smoke ordinances of our eastern cities, and these sizes should be, must eventually be, made as acceptable to the individual housekeeper as are the domestic sizes now used. Some satisfactory progress in this line has already been made. Anthracite operators have no hesitancy in recommending to house owners the installation of such heating equipment as the Spencer Heater, designed for the use of Buckwheat No. 1 anthracite. These heaters, which are of the magazine type, are more economical in the use of fuel than are hand fired furnaces in general, aside from the difference in the price of the fuel, are more easily managed, and give general satisfaction. The more that these steam sizes may be made to bear their proper proportion of the increasing cost of production, the more can the range sizes of stove and chestnut be relieved of theirs.

Pea coal, which is a size midway between chestnut and buckwheat No. 1 is now classed as a domestic coal, though larger quantities than should be are still used as a "steam" size. Pea coal can be used to excellent advantage as regular fuel in the home either by itself or mixed with chestnut or stove coal in stoves or ranges, and for banking furnaces and range fires at night. A saving of approximately $2 a ton may be effected by substituting pea coal for stove or chestnut in the domestic fire. A pamphlet recently issued by the Anthracite Bureau of Information which gives full instructions as to the economy to be secured by the use of small sizes of anthracite can be had free of charge by application to the bureau at 437 Chestnut Street, Philadelphia.

Inroads of Cheaper Fuels

It must be apparent to every one concerned in the future of anthracite, that the industry cannot continue indefinitely to remunerate its labor out of all proportion with that employed in other gainful occupations. Anthracite is not (a general impression to the contrary notwithstanding) an indispensable commodity. There are other fuels that can be used in its stead, and these substitute fuels—bituminous coal, coke, oil (crude and refined) and gas—are at the present time, encouraged by the high cost of anthracite to the consumer, making serious inroads on the anthracite markets. Anthracite producing companies have justly claimed that the industry has given more steady employment to its workers than obtains in any other basic industry. Because of this fact the anthracite region has for several years, up to the unwarranted suspension on April 1, last, been the most prosperous group of communities in the country. It is the desire of the anthracite companies that they shall continue so, that they cannot if the markets for their product are destroyed by the competition of cheaper, if less desirable, fuels. The leaders of the United Mine Workers in their unwisdom of saddling impossible conditions upon the industry and the consumers of anthracite are in a fair way to kill the goose that lays the golden eggs.

THE RELATIONSHIP OF RAILROADS TO MINING

By Ira L. Smith

TAKEN IN COMPARATIVE terms, twenty-five years do not form a wide segment of time. That period, however, is sufficiently broad to hold one complete and most interesting phase of the relationship between the mining industry and the railroads. Beginning in the late nineties and tracing developments through to the present day, the transformation of this relationship from a hectic rushing affair to a steady and discerning movement is evident.

In the earlier days, the railroads of the country had for their inspiration practically the same motives that brought their first ancestors into being in England during the seventeenth century when some genius, whose name is hidden in the past, hit upon the happy idea of transporting coal from Newcastle in carts drawn over parallel lines of planks laid end to end. Transplanted to America, the railroad soon found the development of natural resources furnishing the chief demand for extension of lines.

Westward, Ho!

Discovery of gold in California demanded that the ribbons of steel find their way through the west, and the pioneer builders met the demand with their ingenuity and pertinacity of purpose and effort. Before the final decade of the nineteenth century was born, the great transcontinental lines had been built and already had performed vast services in carrying adventurers and their supplies into the west and bringing back to the older country the precious fruits of the bonanzas. The entire system of transportation of the mines products built up during that frenzied period had come into being attended by a delightful lack of planning. The spirit of "Here's a rich ore find; we need a railroad" had pervaded the development.

This order of things reached well down into the nineties. Then, as the frenzied scooping of high-grade ores turned erstwhile rich fields into "ghosts" or forced them to depend upon the mining of cheaper ores for their existence, the railroads settled themselves down to the job of transporting mineral products in constantly increasing volumes. A more intensive and careful prospecting, necessitated by the passing of the "bonanza era" brought into existence operations designed to handle enormous tonnages of low-grade ores, and dotted the ribbons of country tributary to the rails with a multitude of smaller mines working properties that would have been scoffed and scorned in the earlier times.

Short extensions rather than pioneer progress through stretches of virgin country became the order of railroad development.

Geology the Guide

It was during the first stages of this transformation that the science of geology began to assert itself as the binding link in the relationship of the mines to the railroads. Where ores of high value had once laid almost upon the earth's bare breast, waiting for man to carry them away—careful searches became necessary to discover the places where the rock-tumbling pranks of the ages had hidden the treasures. Instead of flashing to points where bonanzas had been found, the roads were forced to feel their courses, following the paths dictated by scientists whose familiarities with the structure and contents of the earth furnished them with guidance. As Clarence King, eminent geologist - explorer and first director of the United States Geological Survey, declared: "Geology ceased to be dragged in the dust of rapid exploration."

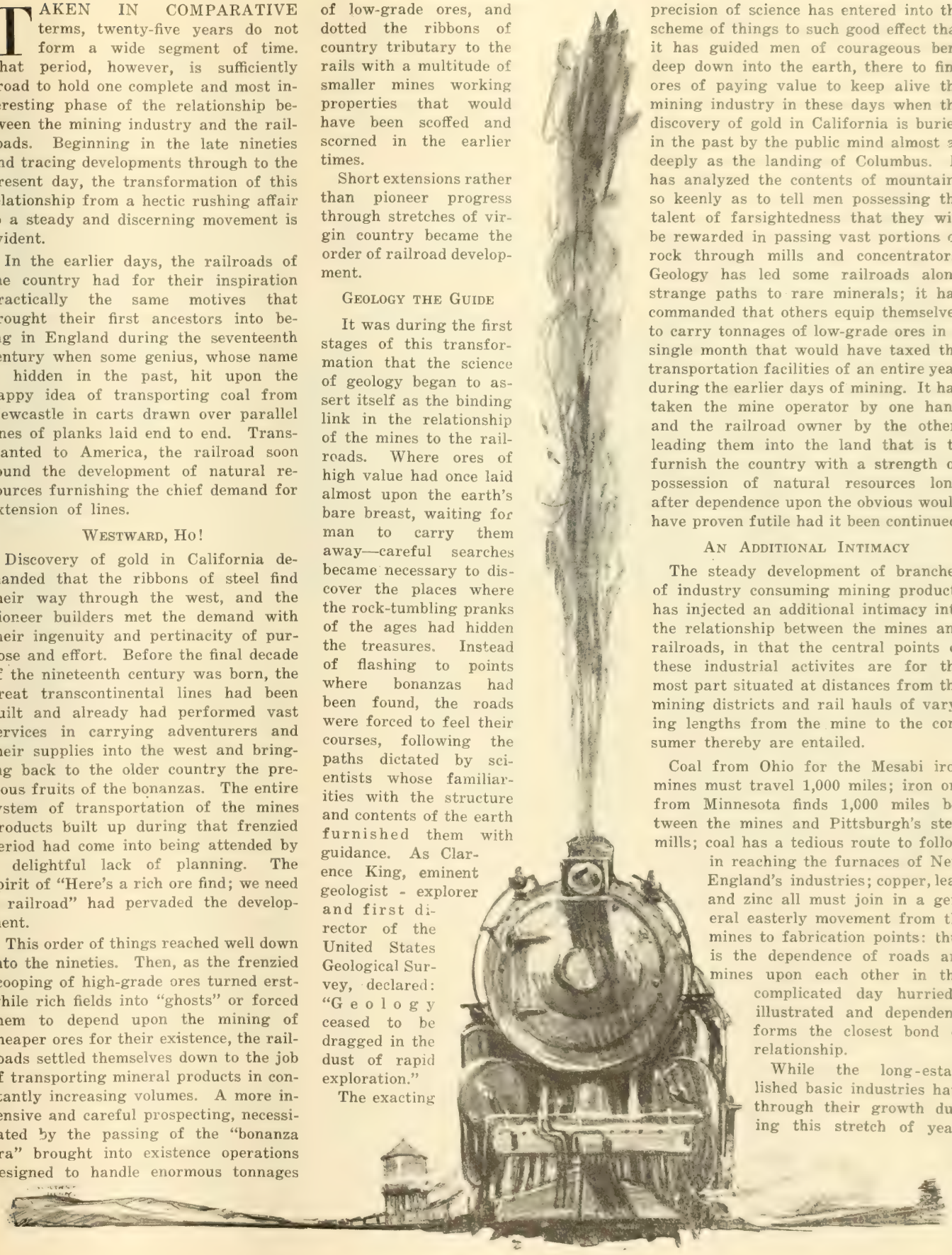
The exacting precision of science has entered into the scheme of things to such good effect that it has guided men of courageous bent deep down into the earth, there to find ores of paying value to keep alive the mining industry in these days when the discovery of gold in California is buried in the past by the public mind almost as deeply as the landing of Columbus. It has analyzed the contents of mountains so keenly as to tell men possessing the talent of farsightedness that they will be rewarded in passing vast portions of rock through mills and concentrators. Geology has led some railroads along strange paths to rare minerals; it has commanded that others equip themselves to carry tonnages of low-grade ores in a single month that would have taxed the transportation facilities of an entire year during the earlier days of mining. It has taken the mine operator by one hand and the railroad owner by the other, leading them into the land that is to furnish the country with a strength of possession of natural resources long after dependence upon the obvious would have proven futile had it been continued.

An Additional Intimacy

The steady development of branches of industry consuming mining products has injected an additional intimacy into the relationship between the mines and railroads, in that the central points of these industrial activites are for the most part situated at distances from the mining districts and rail hauls of varying lengths from the mine to the consumer thereby are entailed.

Coal from Ohio for the Mesabi iron mines must travel 1,000 miles; iron ore from Minnesota finds 1,000 miles between the mines and Pittsburgh's steel mills; coal has a tedious route to follow in reaching the furnaces of New England's industries; copper, lead and zinc all must join in a general easterly movement from the mines to fabrication points: thus is the dependence of roads and mines upon each other in this complicated day hurriedly illustrated and dependence forms the closest bond of relationship.

While the long-established basic industries have through their growth during this stretch of years



contributed the main traffic demands from mine to mill or factory, the discovery of new metals and new uses for old metals has amplified the bulk of mine production placed upon rails for transportation. These discoveries again emphasize the decided manner in which the sciences of geology and chemistry are reigning over the situation. New metallurgical methods have made possible reclamation of ore from the dump to which no attention was paid during boom days: thus streaks of rust which had not felt a rolling wheel for years have been transformed into lanes for activity as possibilities of wealth have been uncovered by science.

As the past century drew to a close, with its final days bearing an unprecedented development of the mineral resources of the country, the mining industry was beginning to reap the full benefits endowed upon it by legislation stabilizing the rail transportation facilities of the country. It remained for passage of the amendment to the interstate commerce act in 1906, however, to provide the mining industry with the fuller elimination of uncertainties that came with increased watchfulness in a balancing of rates throughout the country. Costly rate wars that tended to demoralize individual roads and discriminate in other ways against particular mining districts were swiftly relegated to the shelf of evils of the past. The vicious practice under which rebates were granted to certain favored mining operations was rendered impossible, and thus the handicap of competing with high favoritism was removed from development of those properties which had been made victims of this type of discrimination.

An Interesting Study

An interesting study is presented in figures showing increases in mileage of railroads in mining states. Mileage of roads in Idaho increased from 206 in 1880 to 2,178 in 1910; Montana, from 106 to 4,207; Nevada, from 924 to 2,276; North Dakota, from 1,940 to 4,932; Utah, from 842 to 1,985; Washington, from 289 to 4,534; West Virginia, from 691 to 3,600; New Mexico, from 758 to 3,032; Colorado, 1,570 to 5,532; California, 2,195 to 5,305; Wyoming, 512 to 1,664; Arizona from 349 to 2,097.

These vast increases can be ascribed almost entirely to mining developments. They are the more astonishing when it is remembered that the topography of these states presents the hardest problems with which railroad construction engineers can be faced.

The utter dependence of roads operating over these mileages upon transportation of mine products for their existence is thoroughly obvious. In comparing the mileage for each 10,000 inhabitants in the mountain states with corresponding figures showing the average for the entire country, given by the Bureau of the Census in 1918 as 24, interesting results are found. The mining states rise far above this figure, for in the same year Montana possessed 103 miles of road for each 10,000 of her inhabitants; Nevada, 198; Wyoming, 101; Arizona, 90; New Mexico, 67; North Dakota, 66; South Dakota, 57; Colorado, 55; Oregon, 36; Utah, 47; Washington, 33 and Idaho, 61.

In studying the mutual dependence of the railroad and mining industries, it is interesting to note the parallelism that marks the extension of mileage of the roads and increase in production of the mines. In 1840 the total mileage of roads in the United States was 4,535 and the production of pig iron amounted to 256,000 tons. The corresponding totals for 1900 were 250,142 miles and 13,620,703 tons. The close relationship between these increases in mileage and production is shown by the fact that the figure 53 serves as a multiplier to indicate the increase in both cases. Substitution of one ton for every fifty of pig iron production gives practically the same result when copper production is compared with the rate of railroad extension, and the outputs of lead and zinc show a ratio of increase marching just as steadily abreast of that in rail transportation facilities.

A Uniform Similarity

So uniform have been the contemporaneous careers of the mining and rail road industries in the mineral producing states that to give detailed histories of the developments in each location would largely be a matter of repetition. By taking the history of any one of the states and making a substitution in names and slight changes in dates, the general trend of all could well be outlined. In practically all cases, the first real advance in production figures on a large scale came in the latter nineties, with the increase in railway mileage at all times holding the same proportionate rate of growth.

Thus a history of the Colorado Rockies quite correctly indicates the general trend of the relationship between the roads and the mines covering a much broader field. Elaborating upon this point, Arthur Ridgway, an executive of the engineering staff of the Denver and Rio Grande Western, simmers this relationship down to that between his road and the mining operations in the territory tributary to it. The analogy between this sectional study and that of the relationship of transportation and mining as a whole is impressive.

The following is Mr. Ridgway's development of the thought on this comparative scale:

A history of the mining development in the Colorado Rockies is a history of the Rio Grande. The two present in a striking manner the intimate and essential co-relation and inter-dependence of the mining and transportation industries in what is perhaps the most extensive and at once highly mineralized districts in the United States. From the following of the prospector through the rocky canons, over high mountain passes and among lofty peaks, with the narrow

RAILWAY MILEAGE AND ANNUAL OUTPUT OF MINE PRODUCTS

	Miles in Operation	Total Minerals	Gold	Silver	Copper (Long tons)	Coal (Long tons)	Zinc (Short tons)	Lead (Short tons)	Iron Ore (Long tons)	Pig Iron (Long tons)	Aluminum (Pounds)	
1890	167,191	$606,416,380	$32,845,000	$57,242,100	115,966	140,866,931	63,683	143,630	16,036,043	9,202,703	61,281	1890
1891	172,035	605,385,029	33,175,000	57,630,000	126,839	150,505,954	80,873	178,554	14,591,178	8,279,870	150,000	1891
1892	175,691	622,543,381	33,015,000	55,662,500	154,018	160,115,242	87,260	173,305	16,296,666	9,157,000	259,885	1892
1893	179,834	543,693,967	35,955,000	46,800,000	147,033	162,814,977	78,832	163,982	11,587,629	7,124,502	333,629	1893
1894	182,733	549,374,767	39,500,000	31,422,100	158,120	152,447,791	75,328	162,686	11,879,679	6,657,888	550,000	1894
1895	184,628	640,771,528	46,610,000	36,445,500	169,917	172,426,366	89,686	170,000	15,957,614	9,446,308	920,000	1895
1896	186,681	640,544,221	53,088,000	39,654,600	205,384	171,416,390	81,499	188,000	16,005,449	8,623,127	1,300,000	1896
1897	188,844	646,992,582	57,363,000	32,316,000	220,571	178,776,070	99,980	212,000	17,518,046	9,652,680	4,000,000	1897
1898	190,870	724,274,854	64,463,000	32,118,400	235,050	196,407,381	115,399	222,000	19,433,716	11,773,934	5,200,000	1898
1899	194,336	1,014,355,705	71,053,400	32,858,700	253,870	226,554,636	129,051	210,500	24,683,173	13,620,703	6,500,000	1899
1900	198,964	1,107,031,392	79,171,000	35,741,100	270,588	240,789,310	123,886	270,824	27,553,161	13,789,242	7,150,000	1900
1901	202,288	1,141,856,971	78,666,700	33,128,400	268,782	261,874,836	140,822	270,700	28,887,479	15,878,354	7,150,000	1901
1902	207,253	1,322,943,135	80,000,000	29,415,000	294,423	269,277,178	156,927	270,000	35,554,135	17,821,307	7,300,000	1902
1903	213,422	1,489,676,328	73,591,700	29,322,000	311,627	319,068,229	159,219	282,000	35,019,308	18,009,252	7,500,000	1903
1904	220,112	1,362,092,768	80,464,700	33,456,024	362,739	314,121,784	186,702	307,000	27,644,330	16,497,033	8,600,000	1904
1905	225,196	1,623,664,185	88,180,700	34,222,000	402,637	350,645,210	203,849	307,514	42,526,133	22,992,380	11,347,000	1905
1906	230,761	1,903,229,387	94,373,800	38,256,400	409,735	369,783,284	199,694	336,200	47,749,728	25,307,191	14,910,000	1906
1907	236,949	2,069,941,398	90,435,700	37,299,700	387,945	428,895,914	223,745	352,381	51,720,619	25,781,361	17,211,039	1907
1908	240,846	1,594,696,842	94,560,000	28,050,600	420,791	371,288,123	190,749	311,666	35,983,336	15,936,018	11,152,000	1908
1909	244,084	1,886,756,730	99,673,400	28,455,200	487,925	411,441,621	230,225	252,839	51,155,437	25,795,471	34,210,000	1909
1910	249,992	1,991,216,220	96,269,100	30,854,500	482,214	447,853,909	252,479	375,402	56,889,734	27,303,567	47,734,000	1910
1911	254,732	1,926,284,008	96,890,000	32,615,700	489,836	443,188,505	271,621	391,995	41,092,447	23,649,547	46,125,000	1911
1912	258,033	2,244,033,833	93,451,500	39,197,400	555,031	477,202,303	223,907	392,517	57,017,614	29,726,937	65,607,000	1912
1913	261,036	2,441,618,171	88,301,023	40,864,871	546,645	508,893,052	337,252	411,878	61,980,437	30,966,152	72,379,000	1913

gauge rails of forty or fifty years ago to the modern movement of the two thousand ton train load of coal, coke, ore or bullion, it is indeed difficult to discern which of the two industries led and which followed.

Small Variation Shown

For forty years the traffic in products of mines has not varied 15 percent from a mean of 75 percent of the total freight traffic. A comparison of the growth in mileage by extension to newly discovered fields, or to dormant fields ready for development, with the increase in tonnage carried presents a most remarkable study.

Next in importance, inquiry naturally centers in division of traffic as between metallic and non-metallic minerals which may be conveniently segregated into the two general classes of metalliferous ores and coal respectively. The continuous growth of the population of the territory served has naturally been accompanied by an equally constant rise in the volume of coal and coke transported, and therefore, the proportion of fuel to other commodities carried has within rather narrow limits remained remarkably uniform. But without any apparent reason or fixed relation between the production of coal and coke and metalliferous ores, the contemporaneous reverse fluctuations in the relative proportions of these two primary mine products carried have neutralized their separate effects, so that for many years the traffic in all mine products has remained a singularly constant proportion of the total traffic. Then there is always present the element of production in its relation to transportation. This centers on whether or not changing methods of ore treatment involve the carriage of greater or less ore tonnage. In the case of coal, there can be little variation for practically the entire volume of this product must needs be transported by rail. But with metalliferous ores the methods of treatment, metal extraction and refinement is likely to have a far-reaching effect upon the required transportation service.

All these factors, as well as the entire relation of transportation to mining are discernable in figures in which are traced the life lines of the roads and the mining industry in Colorado and Utah. The distinct character as a carrier of mine products; the remarkable counteracting undulations of the coal and ore traffic; the quite considerable proportion of miscellaneous products of mines; and over all, the fairly uniform and heavy ratio of total mine tonnage to total traffic through a long period of years is depicted.

More conclusive confirmation of the direct ratio of coal traffic to production could scarce be imagined than is apparent in the great similarity of the two lines illustrating in striking measure the intimate relations between tonnage of coal carried and volume mined. That such is not the case with the production of metals is just as clearly evident, the volume of ore traffic being influenced by concentration or reduction processes applied at the scene of the mining operations.

Situation Summed Up

The whole mining and transportation situation is easily summed up. The year the famous camps were reached by the rails; the consolidations bringing in the additional tonnages; the lag of mine product traffic far behind railroad construction as traced in the slow growth of tonnage hauled notwithstanding the striking increase in mileage in the early eighties; the remarkable rise in traffic from 1904 to 1911 with little or no additional mileage and the fluctuations in tonnage transported just before, during and immediately after the war period are some of the salient features running through this figure.

IN OTHER DAYS

This ample-chimneyed iron horse, now almost as extinct as the dinosaur, was a typical source of motive power for transportation of mineral products

That there could be moved without difficulty and without the construction of additional lines so enormous an increase in tonnage as was experienced in the period 1904-1911 leaves little doubt of the adequacy of transportation capacity for the mining industry in the territory served. In fact, with a network of lines reaching all the principal camps in the heavily mineralized zone of the mountains, the foundation was laid years ago for the intensive development of the mining districts. Transportation is apparently ready and waiting at the door.

Another Typical Illustration

The relationship is entered into in a more intimate presentation of detail by T. M. Schumacher, president of the El Paso and Southwestern System, whose outline of Arizona's industrial history retains all the marks of the same general tendencies and movements prevailing throughout the entire western mining country during the course of the past few decades.

The real expansion in Arizona's mining industry began, Mr. Schumacher points out, in 1896—twenty-five years ago.

While the extremely rich ores which were mined in the early years were already approaching exhaustion, with improvement in mining and metallurgy and transportation facilities, ores of lower grades were profitably treated in ever-increasing quantities.

The story of the relation of the railroad to the Copper Queen Mine at Bisbee is typical. In 1886 the railroad known as the Arizona & Southeastern Railroad was built from Bisbee to Fairbanks and later extended to Benson and became the first link in the present El Paso & Southwestern system of over 1,200 miles. The Copper Queen freight then amounted to 100 tons per day. The tonnage handled by the El Paso & Southwestern in 1920 was five and one-half million. In 1901 the reduction works at Bisbee were removed thirty miles southeast to Douglas, Arizona, and rail connection made. The line was extended 70 miles south to the Montezuma Copper Company's mines at Nacozari. In 1902 the railroad was built eastward from Douglas to El Paso, Texas, and shortly afterward the El Paso & Northeastern, running northeasternly from El Paso, was purchased. With this purchase was acquired the coal fields at Dawson, New Mexico, with their equipment. The coal tipples and coke-making plant were rebuilt. A regular supply of fuel was thus assured to the copper companies of the southwest.

The railroad was extended westward from Douglas to Tucson in 1912. In Montana, the coming of the railroad was followed by the rapid development of her great copper and silver resources, and in Utah the development of the great low-grade porphyry beds was largely a matter of economical transportation.

The Eastern Coal Roads

The contemporary careers of the mining and transportation industries in the east, restricted largely to the handling of coal, during the past twenty-five years are not so highly colorful nor spectacular as those unfolded in stories of western developments. Still, however, they in their way emphasize the unity of the two types of operations so far as the sum

total of industrial progress is concerned.

There is less of the spectacular in the story of the eastern coal handling roads. With them the job merely has been to continue the work begun many years go, to carry on the task of carrying coal from the fields to the consumers, with the entire procedure following closely in the lines set forth when the veteran roads were founded.

One exception, however, stands out to illustrate the newer order of things: it is the Virginian Railway. Thoroughly typical of the changing relationship between geology and transportation, it is situated among a family of roads that either were built to aid Baltimore and its neighbors to offset the effects of construction of the Erie Canal or for other highly localized reasons. Several years ago vast beds of coal lay in the deep-water section of West Virginia, between the two lines tapping the West Virginia coal fields and cut off from consumption points by the sandstone Alleghanies. Following a line of action similar in its basics to that pursued by the men who faced a transportation problem in moving coal from Newcastle, England, in 1602, Henry Huddleston Rogers, of Standard Oil and other fame, saw an opportunity for an industrial creation. He selected two terminae, one at Deep Water, W. Va., and the other at Sewell's Point, on Hampton Roads. Two corps of engineers were told to build a railroad between these points, certain grade specifications carefully worked out in advance being prescribed. The road, known as "Roger's Folly," and costing approximately sixty million dollars, was opened for traffic in 1909 and in March, 1921, gave a demonstration of the results of careful planning by setting a record when a train of 80 gondola cars carried 9,200 tons of coal unaided from Victoria to Norfolk, a distance of 125 miles, in 9 hours and 50 minutes.

In the same field is found the Norfolk and Western, a road which reflects in some degrees the movement following the Civil War under which foreign finance was called in to play its part in laying railroads through the South. This road was established in the early eighties, making possible the capitalization of discovery of the southern edge of the great Pocahontas field which had been made a few years before. Continually stretching its lines throughout the mining sections in the manner typical of the older eastern roads, it opened its Ohio extension and the Clinch Valley Line in the early nineties. In the culmination of this extension plan that first had been undertaken ten years before, the road worked itself into the position of one of the heaviest carriers of bituminous coal in the country. The best record of the extent of mining development along the lines of this road are indicatedly the details taken from its annual report of 1917 showing 31,401,108 tons of coal and coke handled during the year in addition to the following tonnages: iron ore, 1,755,856; pig iron, 1,475,161, and other mineral products amounting to 418,965 tons.

In the Pennsylvania anthracite fields mining has so long been intensively carried on in such a restricted area that recent years have seen but little physical effects rising out of the relationship of the industry with the railroads, since the rails were laid years ago, with little necessity for extension arising since that time.

James Douglas, an eminent transportation authority, in discussing the influence of railroads upon the mining industry of the United States, several years ago gave the following expression:

"The marvelous feats which two generations of engineers, in handling steam and electricity, have enabled us to perform may not be duplicated by equal progress during the next half century, but it goes without saying that but for our transportation facilities we would not occupy in the world's race the same advanced position we have acquired today. The distance of population centers from our resources would have rendered many of them valueless. But, given control of steam, the great size of our mineral deposits and the long distances which our continental area requires us to transport material have inspired our transportation engineers to work on a large scale."

NEW USES OF ZINC

By Stephen S. Tuthill
Secretary, American Zinc Institute

WHEN THE ZINC men of this country organized the American Zinc Institute in 1918, there was a great deal of talk among them about the immediate necessity of finding new uses for zinc to take up the slack in consumption which was expected to follow the ending of hostilities.

A cursory survey by the institute, however, soon convinced them that practically all of the companies manufacturing sheet or strip zinc had, through their technical departments and individual foreign surveys, fully covered the subject of so-called new uses and were already developing certain profitable lines.

Thus confronted, they decided that the finding of an outlet for a largely increased tonnage rather than the finding of new uses was the problem to be solved by the institute.

Familiar with Situation

These men were already familiar with the fact that an increase in the use of slab zinc in galvanizing (zincing) and in brass making was practically beyond their control; likewise, an increase in the use of the salts or compounds of zinc, except, perhaps, zinc oxide and lithopone.

They also realized that there was an excellent opportunity for development along the lines of casting, spinning and drawing, to all of which zinc is especially adapted, as well as in several hundreds of other uses, but that such developments would not yield a tonnage sufficiently large to absorb the shock which they expected would come to them from the inevitable after-the-war readjustments.

Happily, they found that there was one use of zinc which had been practically neglected in this country, a use which yearly consumes 95 percent of Europe's zinc production, namely, roofing.

From more than 100 years of experience with sheet and strip zinc, Europeans have learned that zinc, in batten, corrugated or sheet form, makes the best roofing, because when it is placed on a building one's roofing troubles are at an end. This is equally true of zinc gutters, zinc downspouts, zinc flashing, zinc ridge rolls and zinc valleys. There are thousands of examples of completely equipped zinc roofs in Europe which were placed 50, 75 and even 100 years ago that are today as good as new. Analyses have shown that any American sheet or strip zinc is at least as good as any European sheet or strip zinc, and an American zinc equipped roof will give at least as good service as a European zinc equipped roof. Such installations cannot rust, last indefinitely, protect themselves, require no paint, color themselves attractively, blend with decorative effects, do not stain light surfaces, eliminate replacement costs and assure roof upkeep economy; in fact, zinc is the best roofing material for the money that has ever been introduced here or anywhere else.

Lesson of Europe's Thrift

Europe's thrift bespeaks volumes for the economy of zinc in building activities, and it forms the basis of an appeal which the united American zinc industry is today making to the American people on behalf of this century-tried roofing and spouting material.

With at least one million American homes needing a roof every year, the American Zinc Institute believes that in its advocacy of zinc for roofing purposes, a new use here and an old use abroad, the zinc industry's problem of largely increasing its output with a reasonable profit to all concerned is now on the way to solution.

RÉSUMÉ OF TWENTY-FIVE YEARS IN MINING

(*Continued from page* 940)

The electric steel industry continued to expand. Production of high speed steel was estimated at from 15,000 to 18,000 tons.

The country's output in 1921 was 56 percent below the preceding year, or practically that of 1901. The average value of the ore at the mines was $3.32, a decrease of 79 cents. The pig iron production was less than half that of 1920. Until readjustment has been more nearly completed it would appear that the iron and steel industry must be somewhat erratic. Inability of foreign markets to finance substantial purchases of American steel, high labor costs, not only in iron and steel, but in coal and coke, are now retarding complete rehabilitation of the industry.

COPPER

THE COPPER INDUSTRY saw steady operation in 1896 as a result of the expansion of existing mines and a good export trade. The year's output was 460,061,430 lbs. When many industries shut down following the panic of 1893, the copper mines continued to develop, so that, due to the favorable market abroad, a 10 percent advance in wages was granted certain mining districts.

In 1897 Arizona contributed an increased output and export conditions remained good. The average price was 11¼ cents per lb. The organization of the Amalgamated Copper Co. created excitement in copper circles, and due to the continuation of general prosperity in the industry, great efforts were made to locate new mines.

The year 1899 was marked by extraordinary speculations in copper stocks, and continued favorable conditions in the industry.

Improvements in stamp mills and increased screen area gave increased daily crushing capacity. The Nordberg Mfg. Co. brought out an improved valve gear on stamp mills affording a dead blow and more economical use of steam. With this equipment coal consumption was decreased 36 percent.

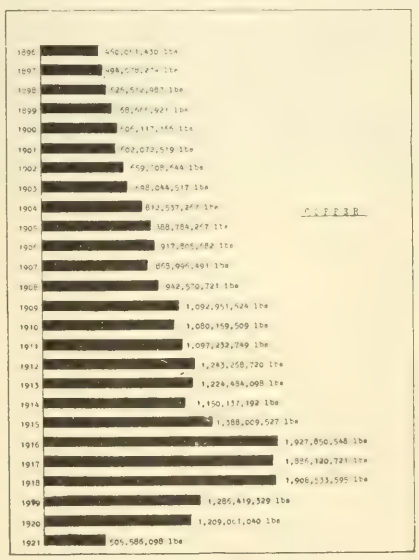
Many New Operations

Many new operations were opened during 1900, but few reached the producing stage. The following year attempts were made to maintain the value of copper at an artificial level, but the collapse left many producers with heavy accumulations of stocks, and long term contracts at low prices.

Consumption of copper increased enormously however, and the export trade revived in 1902, and in 1903 many of the new mines in the Lake Superior, Montana and Arizona districts reached substantial production, thus balancing consumption and stabilizing prices.

In 1904 an unprecedented export demand and high level prices greatly stimulated production. Many improvements in mining methods were introduced, and the metallurgical development of low grade ores rendered the industry less dependent on the discovery and rise of individual rich deposits. It was estimated that 75 percent of the copper then produced in the United States first passed through the stage of copper matte, which was then concentrated by Bessemerizing into blister copper, 95 percent of which was then electrically refined into shapes. The year's production (1905) was 888,784,267 lbs. of which 80,000,000 lbs. went to China alone.

In 1906 the average price was 15 cents per lb. and every effort was concentrated



on mill capacity and efficiency. Car shortage, however, delayed the handling and delivery of machinery, raw materials and fuel. These conditions created such an urgent demand for electrolytic copper that the price rose to 23.8 cents per lb., the highest price in 26 years. An average increase of 10 percent in wages was granted, to remain in effect so long as copper sold at or above 18 cents per lb. During the early part of 1907 copper reached 26 cents per lb., but as soon as the demand was supplied the independents began to cut the price, which fell to 12 cents in October. It was predicted that the new low cost operations of Utah, Nevada and Arizona would be able to mine profitably at 10 cents a lb.

To justify this prediction the Ely district of Nevada began production and the Bingham district of Utah increased its output, wages were lowered, and by virtue of great economies in operation through large tonnage, the price remained low, which caused an increase in consumption, relieving the accumulated stocks. No better illustration is to be found of the working of the law of supply and demand.

For the first time in history the copper output of the United States passed 1,000,000 lbs. in 1909. Many groups of mines were consolidated, the most important being at Butte, Ely, Bingham and Ray, and the acquisition of the Bigelow interests by the Calumet & Hecla.

About this time, however, the courts rendered adverse decisions in the Standard Oil and American Tobacco cases, and several proposed consolidations were abandoned. The Copper Producers' Association first started to render monthly reports during this year.

Domestic consumption exceeded all previous records in 1910, conditions remained good, and a considerable surplus went into export. The utilization of secondary copper in the form of old scrap, amounting to 17 percent of the total consumption of new copper, became a feature of the industry. Extended geological investigation of the copper reserves of the United States was made by Dr. Lindgren and others.

Difficulty was experienced in California with "smelter fumes" and a considerable curtailment took place until means were devised for their elimination. Among the new producers of 1911 were the Miami Copper Co. of Arizona, the Chino Copper Co. of New Mexico, and the Copper River District of Alaska.

In 1912 a general advance in the cost of labor took place, but increased efficiency of operation and process held the cost at about the same. Reverberatory furnaces and a general change from the acid to the basic lined converter, fine grinding in the Lake Superior region, increased recovery by leaching, and concentration by various flotation processes, marked the progress of the industry. Secondary copper amounted to 27.5 percent of the domestic consumption of new copper. A five months' strike during 1913, in the Lake Superior district and the destruction of a large producing plant in Alaska caused a decrease in production, partially offset, however, by a number of new producers. The cost of labor continued to increase due to lesser working hours, taxes were higher, with the result that operating costs advanced .0065 cents per lb.

Many Plants Rebuilt

So rapid were the advances in metallurgy that many plants and mills were rebuilt to take advantage of the saving afforded. Unfavorable market conditions induced by the war caused the 1914 output to fall off from 30 to 50 percent. The average cost of electrolytic copper was 8.62 cents per lb. The in-

stallation of flotation plants in concentrating mills marked a distinct advance, while leaching of low grade oxidized ore and the recovery of copper from tailings was actively prosecuted. The Copper Producers' Association discontinued its monthly reports and disorganized.

Development of Processes

The development of processes installed in 1914 added from 10 to 20 percent to the recovery of metal from concentrating ores in 1915. Capacity was greatly in excess of the demand. Nineteen hundred and sixteen was the record year in the industry, with an output only slightly under 2,000,000,000 lbs. Production costs averaged 11.3 cents per lb. Much discussion took place over the relative importance of large and small mines, and the effect of price fixing by the government. It was generally felt throughout all the producing fields that the increased price of copper and the higher wage scale had reacted to create marked inefficiency of labor.

In 1917 the scarcity of men due to calls of the war and its industries, labor inefficiency, and difficulties of transportation, all served to hamper production and delivery. These conditions continued throughout 1918, and fluctuating prices militated against buying. Foreign demand collapsed and the price dropped below the cost of production. The average yield was 1.51 percent of copper or 30 lbs. per ton. After the signing of the armistice a copper export association was formed under the newly-created Webb Law, for concerted action in foreign marketing.

Large Stocks on Hand

Large stocks were on hand and productive capacity continued to be in excess of the requirements. Low exchange hampered the development of an export trade, and the high cost of living kept wages at a prohibitive standard. Many of the small mines were shut down, but the larger companies, having anticipated the condition were enabled to weather the storm. In view of the expansion of the electrical and mechanical arts the ultimate recovery of the copper industry was inevitable, and it appeared that reserve ores must be developed to meet ultimate requirements.

The death of Dr. James Douglass in June, 1918, was deeply felt throughout the United States. Dr. Douglass had been one of the pioneers in the copper industry and for a generation had been identified with its development.

The price of copper was determined by agreement between the producers and the War Industries Board and varied from 23½ to 26 cents per lb. The following year the Federal Trade Commission determined the average cost of production to be 16.17 cents per lb.

Nineteen twenty opened with heavy sales and exports which only continued for a short time, leaving large accumulations of unsold stock, which caused a depression followed by closing of many mines and smelters. Notwithstanding the fact that labor troubles and increased railroad rates on coal and supplies added to the cost of production, the price of electrolytic copper was arbitrarily cut from 19 to 12¾ cents per lb. to stimulate sales. The amount of old copper, brass and alloys salvaged from European war materials, added to unfavorable exchange rates, paralyzed the export trade.

THE RESULT OF INDUSTRIAL GENIUS

The Arthur plant of the Utah Copper Company is one of the largest concentrating operations in the porphry copper district of the west, having a daily capacity of 16,000 tons.

American-owned mines in South America, Mexico and Canada sent their smelter output to the refineries in the United States, thus making this the greatest copper-producing country in the world.

Nineteen twenty-one continued to be a dull year for the industry. Managers of properties generally took advantage of the shut-down to overhaul their plants and to introduce labor saving devices and improved metallurgical equipment. The Copper Research Association conducted a publicity campaign to induce the use of copper and brass and to find new uses. The substitution of mechanical for hand labor wherever possible, of power haulage for hand tramming, the introduction of scrapers to pull the ore down the stopes, and a caving or shrinkage system whereby the ore runs down into the chutes, all marked the progress of the industry. Probably the copper industry has been the greatest beneficiary of the flotation process, approximately three-fourths of the total flotation tonnage being handled in copper mills.

A Phenomenal Development

As in the history of the cyanide process, the gold deposits of South Africa and the cyanide process had each a phenomenal, simultaneous and interdependent development; so in the porphyry coppers of the southwest, flotation from 1914 on, found its field and opportunity. In fact, without flotation concentration it is safe to say that many of the larger copper mines of the country could not operate under normal price conditions.

In two respects the flotation process is unique; first, in the rapidity of its growth, and second, in the limited information, even among those who have employed it most, of the basic principles upon which it rests.

The twenty-five year period reviewed, had entered upon its last third before the flotation process had passed from experiment to successful commercial application; yet today excepting only iron blast furnace smelting, flotation far exceeds every other metallurgical process in tonnage of material handled.

Lead, silver, and gold, in the order named, have benefited also from flotation but to a lesser degree. In connection with the electrolytic treatment of zinc concentrate, flotation has played an important part, although adopted with hesitation by the operators of the Mississippi Valley. In the field of the minor metals and the steel alloy elements it has been very generally employed. For separating the impurities of coal, and of quartz from feldspar, and notably in the concentrating of graphite, the process is recognized as offering distinct advantages.

Much litigation took place over certain basic patent rights and in championing the rights of the mining public the American Mining Congress took no small part.

A Classic Statement

Mention was made of the limited information about the basic principles of flotation even among those using it most. One of the attorneys in the historic litigation said: "The mineral clings to the bubble by reason of the fact that it does cling to the bubble." If a certain oil and a certain acid did not give the desired results, there was nothing to do but to try all of the various possible flotation agents until some combination

turned the trick. Quoting from Dean Francis A. Thomson of the University of Idaho, himself an authority and one of the original investigators in flotation, "The light is now breaking. The recent research of Dr. Irving Langmuir in the laboratories of the General Electric Co., and of A. W. Fahrenwald and R. B. Elder of the U. S. Bureau of Mines staff at Moscow, Idaho, on interfacial tension, oil adsorption and ion adsorption, bid fair to lead us onto solid ground where we can take a given mineral and determine once and for all its flotation characteristics as readily as we determine its specific gravity or its reaction to sulphuric acid. Flotation results will then become predictable, and still further applications of this remarkable and revolutionary process will be possible."

LEAD

FEW INDUSTRIES can show as uniform a graph over a 25-year period as lead. Beginning in 1896 with a production of 188,000 tons and growing with almost imperceptible fluctuations to a maximum of 429,732 tons in 1918, the lead industry is of especial interest. The general industrial depression of 1896 decreased the normal consumption of lead by 20,000 tons, but the production was always less than the consumption, so that the effect was felt by importers rather than producers.

In Southeastern Missouri the production is lead ore. In Southwestern Missouri and Southeastern Kansas the production of lead is an incident in the production of zinc. In the Rocky Mountain district the lead output varied directly with the price of silver. A decline in silver, therefore, meant a reduced demand for lead bearing ores as a flux. On the other hand an advance of 1 cent a lb. in the price of lead would offset a decline of 6.7 cents an oz. in silver. Many advocated a duty therefore which would raise the price to the importing point and stimulate the production of lead.

Effect of Labor Troubles

Many plants were still inactive in the Coeur d'Alenes as the result of the 1895 labor troubles there. Prices fluctuated from 3.15 to 2.65 cents per lb.

In 1897, however, labor conditions were good and production was a maximum. The year following many large smelting and desilverizing plants consolidated into the American Smelting and Refining Co.

Smelter strikes in Colorado and a shut-down in the Coeur d'Alenes curtailed the output in 1899. The average price for the year was the highest since 1891, being largely stabilized by the consolidation of the year before. The increased prices, however, brought increased output in 1900, which left very large stocks on hand. The same was true of 1901. Idaho was the largest producer; Leadville, Colo., the largest single district. Many independent smelting plants were built.

Foreign prices were low in 1902 and it was necessary to drop prices in the United States to prevent greater importations. Nineteen hundred and three saw the completion of the high tension line from Spokane, Wash., to Burke, Idaho, 101 miles. Several of the corporate lead interests effected further consolidations. Nineteen hundred and four was the beginning of increased consumption of lead and a fair level of prices.

AN IMMENSE LEAD SMELTER

The Bunker Hill & Sullivan Smelter at Kellogg-Wardner, Idaho, operating on pulverized coal for fuel, is the largest development of its type in the country.

Great Prosperity In 1905

Nineteen hundred and five was known in the industry as "A year of highest prosperity." Increased values were found at deeper levels in Idaho. Leadville contributed more than one half of the total output of Colorado. The cave-in of the Ontario tunnel at Park City, Utah, caused a temporary decrease in production. Consolidations of smelters continued. As consumption rapidly increased in 1906 exports and imports fell off. Prospecting showed unsuspected reserves in the Coeur d'Alenes and in Missouri. Several new electrolytic and roasting processes were introduced, but shortage of labor, fuel and railroad cars limited the output.

The American Smelting & Refining Co. dominated the field with the United States Smelting, Refining and Mining Co., a significant competitor. The depression of 1907 affected lead in common with all similar industries. Prices fluctuated from 6 1-3 cents, the highest in 30 years, to 3½ cents, the lowest in 10 years. Missouri passed Idaho in production. Nevada and Wisconsin doubled their production. Lead recovered from the depression, however, much more speedily than many other metals. Output increased as the price rose. Bag houses were introduced to increase the recovery. The Dwight & Lloyd process also came in, in 1908. The smoke problem was acute with many smelters, some of which were compelled to close down.

In 1909, in order to avoid price cutting, and to create a single selling agency, an association of Spanish, Belgian, German, Australian and American producers was formed, and Frankfort a/Main superseded London as the principal lead market of the world. Independent competition, however, largely nullified these efforts.

For the first time, in 1910, soft lead production equalled that of argentiferous lead. Many new smelters were erected and old ones enlarged. New processes were introduced for smelting mixed sulphides of lead and zinc, which increased the employment of mechanical appliances for blast roasting of sulphide ores, and solved smelter smoke problems.

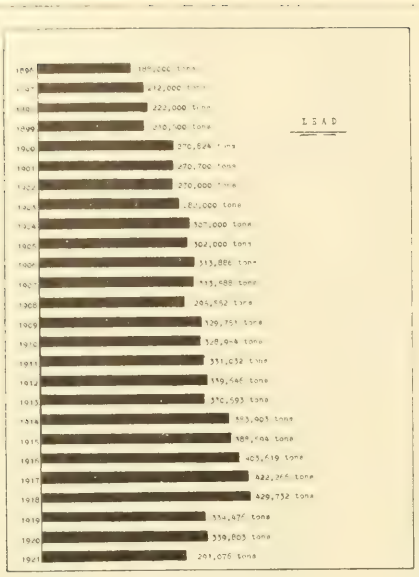
The output of Arizona was quadrupled in 1911. The principal uses of lead were as white lead dioxides, pipe, sheet, and shot. The International Sales Association organized two years previous, justified its existence as evidenced by price curves for that period. The following year an International White Lead Association was formed in London, followed by a rise in the price of white lead from £16 to £22 per ton.

Decline in Mexican Output

During 1913 and 1914 the Mexican output continued to decline. The demand from Europe for war lead in 1914 had to be satisfied by domestic output which increased over 100,000 tons in excess of the output ten years before. Flotation units were installed in practically all the concentration plants connected with the lead mines of the disseminated lead districts of Southeastern Missouri and Idaho. The increased saving in metallic content resulted in material increase in production and consequent low price of 3½ cents per lb.

Nineteen hundred and fifteen signalized the construction of the Bunker Hill and Sullivan smelter, which began operation in July, 1917. Due to the war, lead importations were heavy. In April, 1916, the price rose to 8 cents a pound, declining in August to 6 cents. In 1917 the war price rose to 12¼ cents in June, and heavy exports continued.

Lead



In 1918 the War Service Advisory Committee on lead determined that one-sixth to one-fifth of the domestic production was needed by the government. Accordingly, the specified portion was set aside at a uniform price of 8 cents per lb. f. o. b. East St. Louis. The response was gratifying, notwithstanding a market ranging from 10 to 12 cents, the entire requirements of the government being supplied by the large producers.

In the fall the fuel and food control bill, making it illegal for any person financially interested in an industry to act in an advisory capacity, was passed, and necessitated the disbanding of the committee notwithstanding its service to the government. The work was then carried on by the War Industries Board.

Post-War Depression

The post-war depression in common with the other metallic industries, brought the price down to 5.3 cents per lb. in 1919. The following year foreign lead began to come in again and the price dropped to 4½ cents per lb. The principal consumption was for white lead in paint, storage batteries, cables, and conduits. Idaho led on the production with an output double that of Utah and eight times that of Missouri.

Pulverized coal was introduced for smelting at the plant of the U. S. S. R. & M. Co. in Utah, and at the B. H. & S. plant in Idaho. Improvements were made in the D. & L. machines, Cottrell fume precipitators were in general use, and vibrating screens were replacing steel trommels.

While the output decreased in 1921, the lead industry held its own better than many others. The average price was about 4½ cents per lb. It appeared that for some time to come, American lead producers would have to compete with European lead produced with cheap labor.

Hand drilling is being supplanted by power drilling, and electric haulages are being installed in many mines. The same need for mechanical handling of ore as is felt in the copper and other industries, is recognized in lead. More than all else, a protective tariff appears to be the only means by which so great an industry can continue to function. The artificial protection afforded by the war was the only thing which saved the lead industry. In many cases war conditions amounted to an embargo, equivalent to a tariff.

SILVER

THE QUARTER-CENTURY under observation opened in 1896 with silver at 67 cents per oz. The output for the year was 58,834,800 ozs., with Colorado and Montana leading. The price dropped the following year to 60 cents, and there was very little change in conditions until 1902, when Nevada showed a great gain due to the Tonopah, the price, however, dropping to 53 cents.

Supplied by Lead Ores

In 1904 one-half of the entire production came from the smelting of lead ores. The price rose to 61 cents per oz. in 1905 and it was hoped that production would be stimulated, but such was not the case. Increased quantities of silver were derived from copper ores and dry silver ores.

The period, 1906-1915, was one of slightly fluctuating output from year to year, the great silver producing states of the west rivalling one another for first place, and the price fluctuating between 68 cents and 52 cents per oz. Nineteen hundred and eleven marked the peak of the world's silver production, which period was not reached in the United States until 1915, with a production of 74,961,975 ozs. During this year the output of Alaska increased 300 percent, amounting to 1,071,782 ozs. War demands for silver in 1916, its coinage to protect gold currency and avoid excessive paper money, and the use of silver nitrate in the moving picture industry, found the industry hard put to maintain the supply, due to a falling off of by-product silver, and falling production due to high cost of labor and supplies.

A Drop in Output

Scarcity of potassium cyanide increased the use of sodium cyanide. War conditions in 1917, added to inefficiency of labor, caused a drop in output. The Anaconda Copper Co. led the American producers from copper ore, the Hercules Mining Co. and the B. H. & S. Mining Co. from lead ore, and the Tonopah Belmont Development Co. from siliceous ore. The Presidio Mine in Texas was the largest producer of silver from ore that contained no appreciable quantity of any other metal.

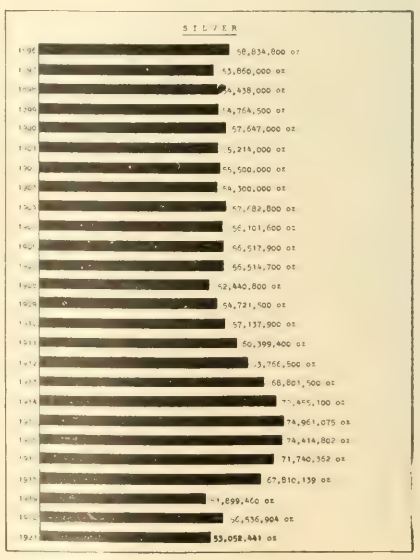
In order to replace silver sold to Great Britain at the same price, as a war measure, the Pittman Act established the price of silver at $1 an oz. until the same should be replaced. A similar government subsidy was discussed in Mexico, and in 1918 the advisability of an international silver producers' association was discussed, to assist in stabilizing the world prices of silver. The Mexican export duty on silver was removed. Flotation and sulphidization were used in many districts on account of the high cost of cyanide.

The average value of silver per oz. including 1920, for a period of 128 years was 81½ cents. The bulk of the world's silver is refined in the United States, but consumption is greatest in Great Britain, India and China.

The 1921 Situation

The production for 1921 was 53,052,441 ozs. As cost of supplies and materials became lower it was anticipated that silver mining would be stimulated. The Pittman Act would in all probability carry for at least two years more, which would tend to stabilize the market. Certain economists advocated the bimetallic standard, in view of the increasing gold reserve in the United States. Mechanical shoveling and electric motor haulage were being introduced in many operations to offset the high cost of inefficient labor.

It appeared probable that with readjustment throughout the country, the silver industry would return to its normal annual output approaching 55,000,000 ounces.



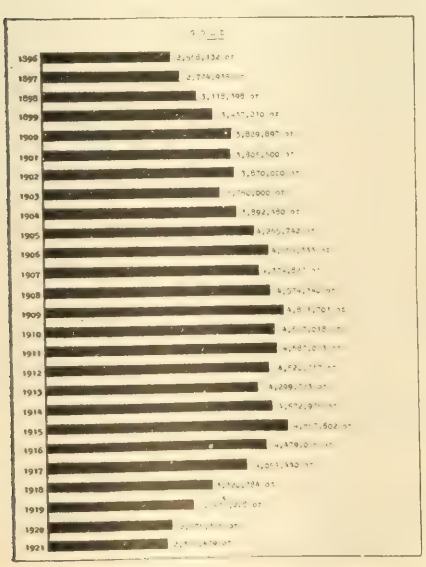
GOLD

CALIFORNIA AND COLORADO led in the production of gold in 1896. The annual output of 2,568,132 ozs. was valued at approximately $6,000,000. With slight fluctuations, the industry showed a gradual growth until 1909, reaching its maximum output in 1915. Due to the exodus of miners from Alaska to the Klondyke district on the Yukon side, the entire production of Alaska in 1897 was only slightly greater than that of Utah. The following year (1898) a large increase in the output of the Cripple Creek district of Colorado placed that state well to the fore. Gold was discovered in the beach sands at Nome, Alaska, and $2,400,000 worth was taken out that season, with a still greater quantity in 1899.

Remarkable Increases Shown

In 1900 the Seward Peninsula of Alaska yielded $5,000,000 and Cripple Creek, Colo., and Arizona also showed remarkable increases, giving a total gain over any previous year. A late season, however, which delayed placer mining, caused a decrease in the Alaskan clean-up the following year.

In 1903 Kansas and Tennessee became gold producers. In 1904 Goldfield, Nevada, and Cripple Creek, Colo., played an important part. Quartz mining in California and inland prospecting in Alaska directed attention to these districts and efforts were made the following year (1905) to district Alaska and secure adequate statistics. Ten states and territories produced over one million dollars of gold each. It was estimated in 1906 that over one and a quarter million dollars was taken from Goldfield by "high graders." The interest in gold mining grew during 1907 and 1908 and many base metal camps were deserted by miners who flocked into the gold areas, opening up many small mines.



California dredging had become an important factor of the industry in 1909, and work was being carried on, on the Roosevelt tunnel at Cripple Creek, which remained incompleted in 1910, thus reducing the Colorado output. Labor troubles in South Dakota added to this, served to reduce the year's output about 200,000 ozs. In 1911 the United States ranked second in the world's output of gold. Two years later the increasing interest in silver mining drew many miners from the small gold camps which still further decreased the production in Oregon and Arizona.

By 1914 there were many small mines in operation in the states of Alabama, Georgia, Maryland, North Carolina and South Carolina. Previous to this time, gold mining had been sporadic in the Appalachian district, the most persistent being at Dahlonega, Ga.

In 1915 for the first and only time in history, the United States produced in value over $100,000,000 in gold. This year marked the peak in the world's gold production, in which the United States still ranked second. (Authority: U. S. Geological Survey Mint Reports, Metal Market Reports and Dept. of Commerce Reports.)

California, Colorado, Alaska, Nevada, and South Dakota, in the order named, produced 81 percent of the gold. The war in 1916 forced the precious metals into the background. This was partly because of lower values in many of the operating fields, with high cost of labor and equipment. Also because of a shortage of labor and an excessive amount of prospecting for base and alloy metals. Thirty percent of the total output in the United States came from eighteen companies, of which thirteen operated in dry or siliceous ores, two in dredging ground, and three secured their gold by treatment of copper ore.

Arizona, however, in 1917, produced an increase of one million dollars in gold output over the preceding year. The world's production having decreased over thirty million dollars, the need for some action to revive the industry was apparent. The high cost of living, the flooding of the Treadwell mines in Alaska, the exhaustion of many dredging gravels, and labor troubles in Montana all helped to depress those interested in the industry.

Fifty-two percent of the entire output of the United States was produced by twenty-five companies, of whom the largest single producer continued to be the Homestake Mine in South Dakota.

THE SCENE THAT GOLD BUILT

The workings of the Homestake Mining Company, at Lead, South Dakota, have brought a fabulous fortune to the earth's surface. The Homestake Mine has been the most uniform gold producer in the United States

The continued stagnation of precious metal mining in 1918, and the great gain in domestic reserves of gold due to excess of imports over exports, was of such concern that gold conferences were held to consider changing the quantity of gold in coinage, a bonus on gold entering into the manufacturing arts, etc., but no constructive action was taken. A joint committee from the U. S. Geological Survey and the Bureau of Mines made a series of recommendations to the Secretary of Interior, but this also failed to relieve the situation.

The 1920 Production

In 1920 the refining of copper bullion and copper ores in Utah and Montana added substantially to the gold production. Placer operations in Oregon and Nevada were active, and 78 dredges were reported in operation, in California, Alaska, Montana, Colorado, Idaho, Oregon and Nevada.

The importation of foreign bullion and coin continued to add to the country's gold reserves. The McFadden bill for an excise tax on gold consumed in manufactured articles failed to pass, notwithstanding the success of a similar tax which is imposed by the French Government on gold used in the arts.

Zinc

The output for 1921 was less than for any other year in the past quarter century. The slight reductions in mining costs are not yet sufficient to make gold mining attractive. As in copper mining, every effort was being made to use mechanical for hand labor, and great need was evidenced for a light, portable, mucking machine.

ZINC

REFERENCE TO THE GRAPH of the zinc industry shows a sound, regular growth in the industry, approximating 14,000 tons each year from 1896 to 1914, inclusive. In common with the other essential industries, the production leaped up in 1916 and 1917, reverting in 1920 to what would have been almost the normal rate of increase had the war not intervened. The sudden decrease in 1921 to less than the output of 1905 called for prompt tariff protection of one of America's greatest industries.

Felt General Depression

A general business depression in 1896 reacted on the brass and galvanized iron trade and caused low production. The forty-year litigation in New Jersey over the ownership of franklinite ore was settled, and a consolidation of various interests effected under the name of the New Jersey Zinc Co.

The utilization of anhydrous silicate of zinc in the manufacture of zinc was proposed on account of its purity. Gas firing was introduced in Kansas, in place of coal. Prices fluctuated greatly in 1897 until a group of smelters consolidated to maintain prices. This stimulated production from outside sources, forcing the association to unload accumulated metal into foreign channels. Toward the close of the year the combines were abandoned and prices again fell.

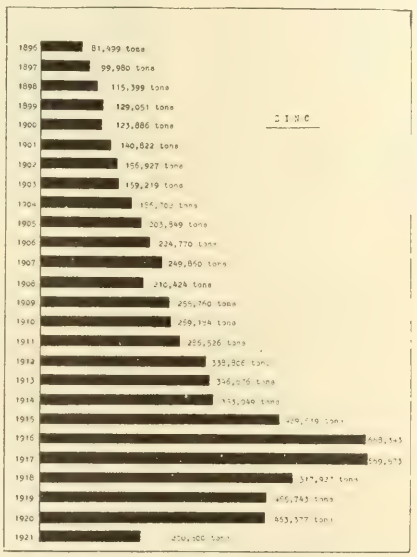
There was great rivalry in 1898 between the older smelters in Illinois, Missouri and Kansas using coal as a fuel, and the newer ones in the Kansas natural gas belt. Predictions of the exhaustion of natural gas checked the exodus of smelters to Kansas however in 1899. High grade ore reached $55 a ton.

The United States became an exporter of zinc for the first time in 1900, the developments of the New Jersey Zinc Co. having so increased surplus stock, with small domestic consumption. Nineteen hundred and one saw rapid development in the Joplin district, and a new source of zinc in Kentucky. European depression lessened the export of spelter.

The following year prices were good and an increased demand at home utilized all available stocks. A proposal was made to form an ore-purchasing company to warehouse and grade zinc ores, re-selling to the smelters at $1.50, but the plan was never matured.

Old Districts Revived

The old zinc ore districts of Wisconsin were revived in 1903, and the next year Kansas smelters were prosperous, due to rising prices and cheap fuel. Until 1905, many exports from Colorado and Missouri were made through Galveston, but domestic requirements ultimately absorbed the supply from these sources, and Northern New Jersey became the source of most of the export product. Importations which began in 1904 from British Columbia and Mexico became so important as to attract attention in 1905, and due to differences in classification, great difficulty was experienced in applying the existing tariff law, which led to



protests by representatives of the Joplin mines.

The demand for spelter and pig drove the price up in 1906 and caused abandoned veins, dumps, tailings and newly-discovered deposits to be exploited. Improvement in ore-tracing methods balanced losses from car and fuel shortages in the northwest. The United States led the world in consumption and equalled Germany in production. This was followed the latter half of 1907 by a production exceeding that of Germany.

1908 saw a slight retrogression in production which was regained in 1909. Some companies which might have operated at a small profit refused to sell at the market price and closed down. Flotation processes were installed in several plants. Electrostatic operation was favored on account of its cheapness, simplicity and efficiency. Research in jigging was directed toward reduction of space, increased capacity and decreased water consumption. Pneumatic operation was not regarded with favor because of losses in dust.

Increases In Smelting

Increases in smelting capacity and new types of furnaces were brought in. Electro-chemical and electro-thermic reduction of complex ores received much attention in the hopes of a larger margin of profit.

In 1909 the United States produced 30 percent of the total world output. A syndicate was formed to control the European production of spelter, the agreement to remain in force for two years unless terminated on one month's notice, and conditional on outside producers so enlarging their output as to raise the European total as much as 2 percent within the limit set by the syndicate. This resulted in the entire stabilization of the European zinc market.

Consumption decreased in 1910 and the production surplus was thrown into export. The foreign zinc association having proved successful, it was extended to 1914. The Zinc Ore Producers' Association at Joplin attempted to establish weekly prices.

The natural gas supply of Kansas was so depleted that pipe lines were built to the Oklahoma gas fields, and crude oil was in some cases substituted for fuel. The commercial preparation of zinc dust, made by subjecting a small stream of molten zinc to a blast of air, was begun during this year. This product was finally declared by the Interstate Commerce Commission to be inflammable.

Continued shortage of gas in Kansas in 1911 required remodeling of coal-burning smelters, and additional pipe lines to the Oklahoma gas fields. The industry continued to grow notwithstanding the dismantling of several plants and an increase in low-grade ore.

A Seller's Market

Rapidly ascending prices in 1912 made it a seller's market, and large stocks were laid in reserve. Previous to 1909, zinc dust was charged back into the retorts, since under the former tariff duty it came into competition with foreign zinc dust imported free of duty, whereas when recovered as spelter it was protected by an import duty of 1½ cents per lb. The Tariff Act of 1909 established an import duty of 1⅜ cents per lb. on zinc dust and the Act of 1913 changed this to 15 percent ad valorem.

Among the new uses for zinc dust were "indigo auxiliary" for dyeing, for dry galvanizing, and as a substitute for zinc shavings in cyaniding. Many developments took place in flotation processes.

As the gas supply of Kansas and Oklahoma fell off, smelters were established in Ohio and Pennsylvania.

Due to the cutting off of importations from Belgium and Germany in 1914 zinc dust again came to the front and every effort was made to save it, the price ris-

ing rapidly. During this year, litigation over flotation patent rights instigated by the Minerals Separation Co. was appealed to the United States Supreme Court. The price of spelter rose during the latter half of the year, due to the munitions demand. Announcement was made by the U. S. Geological Survey after several years' investigation that the average smelter capacity per retort was 3.9 lbs.

Contrary to several years previous, the value of the 1915 output increased 225 percent and the output increased 33 percent. Zinc dust production increased 1,755 tons in five years. Lithopone production increased 43,422 tons in ten years. Several silver-lead-zinc properties were opened in New England but no material production resulted on account of the complexity of the ore. Research in electrolytic reduction continued.

1916 and 1917 were years of maximum production in the industry, the output for each year approximating 670,000 tons. Values rose 33 percent in 1916, but fell 21 percent in 1917. Zinc dust production doubled, 9 electrolytic zinc plants and 64 smelters were in operation.

Formed As Intermediary

In November 1917, the Zinc Producers' Committee was formed to act as an intermediary between the producers and the War Industries Board. A sliding schedule was adopted on an assumed cost of $58 per ton for mining and concentrating, and $33 per ton for smelting, but the armistice was declared before it could be put into complete operation. The American Zinc Institute was organized in St. Louis in 1918.

The output of electrolytic zinc continued to increase in 1919, although values decreased and the total output fell to 465,743 tons.

In 1920 zinc dust production exceeded 11,000 tons, valued at $2,500,000. An important development of the industry was the utilization of sulphur gas evolved in roasting zinc sulphide ores for the manufacture of sulphuric acid. There were 20 plants in operation. This was first attempted in 1882, but was not recognized as an industry until 1914.

During the post-war years the demand for sulphuric acid was greater than for zinc, and considerable quantities of sulphur were burned in order to utilize the full capacity of the plants. The low price of zinc toward the end of the year caused a sharp curtailment of production.

The average labor requirement in smelting a ton of zinc blende was 2½ man-days per ton of ore.

A Notable Development

A successful development of note was the operation of distillation furnaces at Palmerton, with the excess gas from spiegeleisen blast furnaces. The zinc problem was solved by purifying the gas in settling chambers and Theissen washers.

The total output of the United States in 1921 was estimated at 200,500 tons. Prices fluctuated greatly throughout the year, between 12 cents and 8 cents per lb. Sulphuric acid made from sulphur gases evolved in roasting zinc sulphide ores continued to increase in importance.

A slight increase in efficiency of labor was reported by some members of the industry, but costs of operation had not sufficiently fallen to indicate a quick recovery. Increased consumption and protection against foreign imports appeared to be the only solution of the existing industrial depression in zinc.

MANGANESE

MANGANESE, which was first worked in Virginia in the 30's and in Georgia in the 60's, ferromanganese being first manufactured in Georgia in 1874, was mined in seven states in 1896, Georgia, Arkansas and Virginia being the principal sources, and

the average price being $9 per ton. The output was 10,088 tons. The manganiferous iron and silver ores of Colorado were used in the smelters as a flux. Manganiferous iron ore was used in Illinois and manganiferous zinc ores in New Jersey, in the manufacture of spiegeleisen.

Beginning of Brazilian Movement

In California high grade manganese ore was utilized in the manufacture of chlorine gas. The deposits, however, were in many cases far removed from railroad transportation, so that they were only worked when the wagon roads were good. In 1897 Vermont contributed manganiferous iron ore, and over 100,000

tons of high grade ore were imported from Russia, British East India, Chile and Brazil. This was the beginning of the great Brazilian movement of manganese ore. Philadelphia was the principal port of entry.

The war with Spain in 1898 decreased importations and the domestic output increased accordingly. The spiegeleisen industry centered in Northern New Jersey and Eastern Pennsylvania where zinc residuum was available.

The effect of the war the year before, caused considerable agitation regarding the security of the steel industry, but as importations increased the matter was soon forgotten. The principal port of entry for manganese shifted from Philadelphia to Baltimore. Sixty-seven percent of the 1900 output came from Virginia and 29 percent from Georgia. The manufacture of spiegeleisen was begun in Colorado. But little change occurred for several years in the output, the supply, however, vacillating between the several producing states. In 1902 Montana produced three times as much as either Georgia or Virginia but the ore remained unsold on account of high freight rates. A year later Utah became a small producer but Arkansas and Montana were inactive. In 1904 the only production was in Virginia, California and Utah. The prices of spiegeleisen and ferromanganese were so low it was cheaper to import them than to manufacture. Tennessee joined the group of high grade manganese producers in 1905.

The bulk of the product continued to come from small workings operated with little skill and small capital. The Carnegie Steel Co. established a system of bonus and penalty clauses for the purchase of manganese, designed to lower the quantity of silica and phosphorus in the delivered product. The use of manganiferous ores and zinc residuum increased in 1906, and India became the source of heavy importations. The principal use for the domestic production was in the brick, paint, and chemical industries because of higher prices in these than in the steel industry. Less than 20 mines were in regular operation due to inability to compete with foreign ore. (1907.)

Importations Swamped Industry

Only 11 mines made shipments during the year 1908. The rapid growth of the dry battery industry called for additional supplies of manganese. The report of the U. S. Geological Survey for 1909 says: "The importations of manganese ore greatly exceed the quantities mined in this country—a condition likely to continue so long as the principal

sources of foreign supply are large and cheaply worked, ocean freights are low, and there is no tariff on the ore."

There was little sale for the 1910 output which lay in reserve at the mines. The depression of 1911 in iron and steel reacted correspondingly on both production and importation of manganese. California and Virginia were the only producers.

The output of 1912, with the single exception of 1909, was the lowest in thirty years. Indian importations decreased and Russian increased. Ferromanganese prices advanced due to the Russian-Japanese war. This was followed in 1913 by increased importations from Russia and India, so that the price of ferromanganese again declined.

The beginning of the European war, however, brought manganese into the limelight and afforded a demonstration of the potential reserves of the industry in the United States. The question of the Dardanelles in connection with Russian traffic, and the effect of the war on India greatly diminished the importations. The statement was made that Virginia ore could only be mined at a profit when the material yielded by concentration amounted to one-fifth or more of the weight of the ore.

In 1915 many old mines were reopened and new deposits exploited. The U. S. Geological Survey again called attention to the necessity for developing basic raw materials essential to American industries, and the absence of a tariff which would make possible their successful operation. Brazilian imports were four times the average of the preceding fourteen years.

Conditions in 1916

The country was wholly dependent in 1916 on domestic production and Brazilian importation. Washington joined the producing states and Arkansas made a phenomenal increase. In 1917 the number of shippers rose to 175. The output of high grade manganese was 129,405 tons, from 18 states. Three-fourths of the total came from west of the eastern boundary of Colorado, most of which sources had been unheard of before the war.

Nineteen hundred and eighteen recorded the astounding production of 305,869 tons of high grade manganese, a wartime development equalled only by the chromite industry. Although the trade was accustomed to 80 percent ferromanganese and 20 percent spiegeleisen, the Colorado Fuel & Iron Co. completely substituted 32 percent spiegeleisen made locally from domestic ore, and the Lackawanna Steel Co. experimented with low grade spiegeleisen and 45 percent manganese. As a result, there was an entire revision of alloy grades. The War Minerals Committee arranged for skilled engineering and geological assistance to new and inexperienced operators. It was estimated that due to the loyal enthusiasm of the developers, the domestic production eliminated the necessity for 180,000 tons of foreign manganese ore, with the resulting release of 50,000 tons of ship capacity for war purposes.

OPEN-PIT MANGANESE MINING

Open-pit operation at the Algonquin mine, property of the Philipsburg Mining Company, of Philipsburg, Mont., which formerly was worked for silver, being reopened in 1918 and worked for manganese after a long period of rest. The pit shown above was excavated in 1917 and 1918. The darker area in the center of the photograph is a body of manganese oxide ore

After the armistice the curtailment of steel products cut the requirements somewhat, but the renewed importation of foreign ore in 1919 penalized many American operators and the year's production was only 54,957 tons of high grade ore.

Due to lack of a protective tariff and large investments still awaiting adjustment by the War Minerals Relief Commission, the manganese industry remained at a standstill in 1920, although there was an increase in the amount shipped, due to a desire on the part of the producers to dispose of the stocks on hand. The Anaconda Copper Co. alone produced 56,000 tons, or more than the total production in 1919. Indian imports were eight times as great as in 1919, and Brazilian imports continued.

This depression continued into 1921, the only domestic ore of moment coming from Montana. High grade manganese ore production decreased 98 percent; manganiferous iron ore decreased 78 percent; high grade manganese ore production in 1919 came from 42 shippers, in 1920 from 56 shippers, and in 1921 from 14 shippers.

The total production from 1916 to 1920 inclusive was greater than in the previous 78 years and the production in 1921 in spite of unfavorable conditions was double the average of the period 1838-1916.

Probably no one of the war minerals was the subject of more dispute regarding quality and quantity of reserves, than manganese. On the one side were the importers who maintained the absolute inadequacy of American manganese, claiming a minimum of high grade ore and the impracticability of utilizing vast deposits of manganiferous iron ore. Opposed to them were the producers of manganese who claimed to have large deposits of ore blocked out and tested of unquestionable high grade and known value. A third group granted the value of American manganese and a limited extent of reserves, but maintained that these should be conserved for future emergencies. The American Mining Congress, after investigation of both sides, took the stand that sufficient reserves of high grade manganese exist to build up and maintain an industry, and that it should be protected and fostered.

POTASH

PRIOR TO 1850, the United States produced its requirements in potash by burning wood and lixiviation of the ash. The industry decreased, however, into the occasional recovery of by-product potash from other industries. The bulk of the potash consumed in the country was imported from Germany to the extent of $8,000,000 a year in 1910.

In 1911 these importations amounted to $11,000,000, and it was determined that American potash must be developed. Deep drilling was carried on during the next three years, and many samples were taken of salts and bitterns, and the alunite occurrences in the west were investigated. To make potash locations possible, a law was drafted and submitted to Congress to provide for a

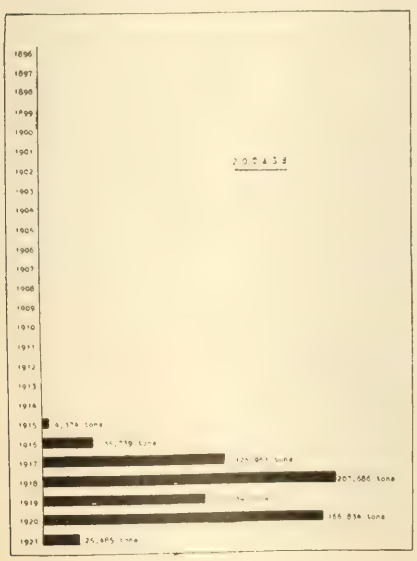
satisfactory title basis. In 1913, the American Trona Co. started construction of a plant at Searles Lake, California, and a 30 mile railroad leading to it. The next year there was a small production from kelp at Long Beach, Cal. Then came the war with its embargoes, and a sudden shortage faced the fertilizer manufacturers. As the war scarcity increased, prices for domestic potash rose to ten times the normal value. The principal source of supply was from by-product plants, amounting in 1915 to $342,000 in value.

In 1916, production, principally from the Trona Co.'s plant at Searles Lake, and the alkali lakes of Nebraska, was ten times that of the year before. Progress was made in handling the silicates, molasses distillery waste furnished a considerable portion, and kelp production of potash continued, but much of it was only made possible by the high prices in effect.

The industries dependent on potash are fertilizer, explosives, electroplating, soap, tanning, photography, glass dyeing, medicine, matches, metallurgy and chemistry.

In 1917 the United States produced 13.6 percent of normal requirements. Forty-five percent of this came from Nebraska. The second largest producer was the American Trona Co.

Utah had several plants operating on brines, Nevada was extracting potash from marshes and in California, kelp, brines and sea water bitterns. New Mexico and Texas were mining regular deposits, and Wyoming made recovery from hot springs. Attempts were made to extract potash from alunite in Utah, Nevada and Colorado, and from cement dust, blast furnaces, silicate rocks, molasses distillery slop, waste water from beet sugar manufacture, wool washings and wood ashes.



By 1918 there were 128 bona fide producers all contributing to America's supply. The brines furnished 53 percent from Nebraska and 20 percent from California. Kelp yielded 9 percent, the balance made up 18 percent. The western supply, as in the case of chromite, and magnesite, was handicapped by freight rates. Seventy thousand tons were held over in surplus stock at the end of the year. Exports were made to the value of $1,372,170. Thus again did America rise to the call and create overnight, an industry capable of supplying the nation's needs for all time.

SEARLES LAKE, CALIFORNIA

Showing pump house and wells of the American Trona Co., from which brine is pumped in potash operations

But when the armistice was signed, few producers had been in business long enough to repay money advanced for construction and operating expenses; some plants were still under construction. Low-priced foreign potash caused the price to fall to $2.50 per unit, which was in most cases below the cost of production.

It was stated at the beginning of 1920 that $25,000,000 had been invested in potash plants. Contracts were cancelled and many plants shut down. The year's production was 184,066 tons from 53 producers. Fifty-seven percent of the product came from the brines, sugar mills and molasses distilleries. Two percent came from blast furnaces and cement dust. Nebraska, California, Utah and Pennsylvania were the leaders in development and production.

The product of the Searles Lake plants was used by chemical companies for the electrolytic production of caustic potash. The foreign exchange situation and lack of a protective tariff laid the potash industry in the hands of the German producers.

Contract for German Product

In September, 1920, thirty-four American fertilizer manufacturers entered into a contract with a German syndicate for a minimum of 75 percent of their requirements.

The most important development of 1921 was the discovery in Western Texas of sufficient reserves of high grade potash containing unusual percentages of potash free from borax to supply the entire domestic requirements for an indefinite period.

Quoting from Richard H. Edmonds: "It is the genius of a great people to develop their own opportunities. It is statesmanship at its high point to overlook the selfish purposes of the moment and to glimpse to the future." When potash and similar industries have received statesman-like treatment, the same energy which developed our supply of minerals in time of war will give the mining industry prosperity in time of peace.

SULPHUR

SULPHUR BEGAN as an industry in 1901. Before that time pyrites was the recognized source for the sulphuric acid requirements. In 1896 the Frasch process of extraction was in an experimental stage in Louisiana, and only the favorable location of the Louisiana sulphur beds and the short haul to New Orleans gave encouragement. Reserves in Utah were too far from the points of consumption to be available. Reports were made on sulphur deposits in Texas in which it was claimed that the product could be placed on board vessels at $10 per ton.

Syndicate Formed

A syndicate was formed to control the supply of Sicilian sulphur and that obtained from alkali waste in England. Its organization was based on the theory that since low prices did not increase consumption of sulphur in 1905, consumption would not decrease because of higher prices which could only be obtained by forming a trust.

The syndicate agreed to pay 50 percent over the price of the preceding year, with an advance of 1 percent for each 3 percent reduction of output ordered, based on a minimum annual production.

The growth of the sulphite pulp and paper industries in the United States was so rapid that even with the increase in price came an increased demand.

Eighteen hundred and ninety-seven saw increased activity in pyrites, in the hope of overcoming the high prices of the syndicate in sulphur. The principal

ports of import for sulphur were New York and Baltimore.

Operations were suspended in Louisiana in 1898, and Utah supplied the domestic output amounting to one-third of 1 percent of the total American consumption.

The Louisiana plants resumed in 1899 but the combined production of Louisiana and Utah was still less than 1 percent of the requirements.

In 1901, however, 241,691 tons of sulphur from native production and pyrites jointly was produced, the two industries being combined in the government records for 1901, 1902 and 1903, after which they were permanently segregated. The bulk of the native sulphur was used in the paper pulp processes while the pyritic sulphur went into the manufacture of sulphuric acid. Nevada supplanted Utah as a producer, Colorado and Wyoming were prospected, Texas developments were begun, and Mexico became an important source of foreign supply. New uses were as a sheep dip, and for the destruction of vegetable parasites.

The output of sulphur alone in 1906 was 144 times that of 1897. One year later imports decreased 72 percent and sufficient development was obtained in Louisiana to supply the needs of the United States.

The Frasch process of sinking 12-inch pipe wells, with smaller pipes inside to provide for the circulation of superheated hot water, thus dissolving the sulphur, which is then forced to the surface by compressed air, had revolutionized sulphur mining, with the added advantage that the sulphur solution, when cooled, crystallizes into practically chemically pure sulphur.

Imports therefore continued to fall, and the inventive genius of Dr. Frasch, coupled with a tremendous reserve of sulphur felicitously located by nature, formed the foundation for an industry which has withstood all attacks from foreign sources.

Nineteen hundred and nine saw a surplus of stocks on hand, so that production decreased. A legal controversy occurred during this year over the proper classification of Bungo sulphur. This sulphur emanating from Japan was so pure that many claimed it should be admitted as refined rather than crude sulphur.

The domestic industry continued to grow during 1910, Sicilian sulphur reaching New York in diminishing quantities. In 1911 a previous Treasury Department ruling was reversed, and Hakodate sulphur was admitted free, which competition immediately closed down the Nevada sulphur plants. Bungo sulphur continued to pay a duty.

Sicilian Lead Overcome

By 1912 the development of the Louisiana sulphur deposits had in seven years destroyed the domination of Sicily, and the United States became one of the two leading sulphur producers of the world. With the opening of the Panama Canal Louisiana sulphur began to displace Japanese sulphur on the Pacific Coast. Experimentation in desulphurizing processes continued in 1913 and the Frasch method of production was introduced in Texas.

LOADING SULPHUR WITH STEAM SHOVEL

One of the settling and evaporating beds of the Union Sulphur Co., where under the Frasch process, the sulphur is dissolved under ground by superheated hot water, the solution pumped to the surface by compressed air, where it settles and crystallizes

In 1914 the Texas operations were producing a substantial output. A fuel oil station and pipe line from the Brazos River to the mines, storage tanks and a 3½ mile canal to bring the river water to the mines, wells for boiler water, and a lime treating plant for the water, were among the required installations.

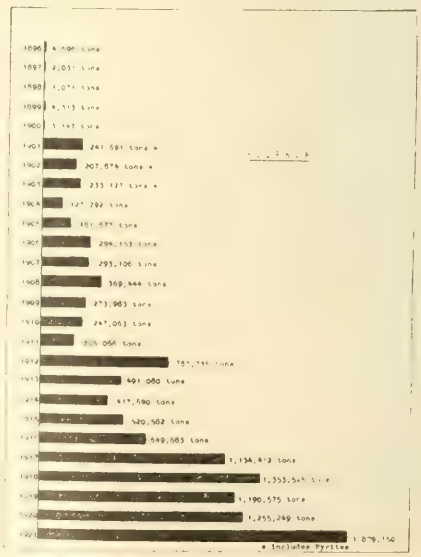
Slack conditions in the paper trade caused a falling off in both domestic and import markets in 1915. The war brought many inquiries for American sulphur, and fear that foreign importations of pyrites would be curtailed, led to a reversion on the part of many sulphuric acid plants, to the use of sulphur.

The necessity for increased supplies due to the war, brought out the fact that Alaska, California, Colorado, Idaho, Louisiana, Nevada, New Mexico, New York, Texas, Utah, Washington and Wyoming all contain sulphur deposits in commercial quantity and position. Ninety-nine percent of the total production came from two wells in Louisiana and Texas. It was stated that the manufacture of paper pulp requires 12½ percent of its weight of sulphur. Less than 1,000 tons were imported in 1917, against a domestic production of 1,134,412 tons, of which 152,833 tons were exported.

The Pre-War Production

According to figures of the U. S. Geological Survey, in the years immediately preceding the war, approximately 300,000 tons of crude sulphur, 1,500,000 tons of pyrites, and 1,000,000 tons of sulphur bearing copper and zinc ores were produced or used for their sulphur content in the United States each year. In 1918 the Chemical Alliance took over much of the work previously done by various boards and committees on chemicals. In February the fertilizer industry was put under license system by the President, thus bringing sulphur, pyrites and sulphuric acid under government control. Importations of pyrites were restricted to 25 percent of the normal.

Labor shortage and excessive wages paid on government work hampered pyrites production, with the result that the 12 leading operations only produced 50 percent of their capacity. Immediately after the armistice, however, the problem became one of absorption of stocks rather than of production. Two mines were producing in Texas and one in Louisiana. Importations became insignificant. By 1920 the productive capacity of the industry was estimated at two million tons per year, and the United States dominated the sulphur industry of the world, notwithstanding the fact that sulphur was only two-tenths of 1 percent of the total mineral production of the country, or in 1921, 1.1 percent of the mineral produc-



tion of the 22 principal industries. The poorer quality of the deposits in other states gave way to the high grade product of Louisiana and Texas, all within 50 miles of the Gulf of Mexico, and under the Frasch process, yielding an automatically refined product.

Highest Output in History

The output for 1921 was the highest in the history of the industry, 1,879,150 tons. Shipments were one-third less than in 1920, however, indicating large stocks on hand. Importations amounted to 50 tons, while exportations valued at $4,524,788 gave indication of the firm position now held by the industry in comparison to its rank even twenty years before.

A recent article on the Marketing of Sulphur gave forty-nine separate products in which sulphur is required for manufacture, and listed the following eight industries which utilize sulphur as a raw material:

Acid phosphate.
Paper.
Chemicals (other than sulphuric acid).
Sulphuric acid (other than chemicals).
Agriculture (other than acid phosphate).
Rubber.
Galvanizing.
Explosives.

Of these the paper industry is principally in New England and Eastern Canada, the chemical industry in the eastern states, and the acid phosphate industry in the southeast. The sulphur produced is safely 99.7 percent pure, and the great problem of the industry is to find an outlet for sufficient tonnage to permit operating at a profit when selling at a competitive price with pyrites.

TUNGSTEN

THE FIRST official mention made of tungsten mining in the United States was a company formed in 1898 to work the Hubbard mines in Connecticut, for tungsten and wolframite. The following year this company erected a plant, and wolframite deposits were reported in Arizona, Nevada and Colorado. Up to this time the principal use of tungsten was as a fireproofing salt and an addition to dyes to render them fast colors. Great diversity of opinion existed as to its value in steel, and the only ferro alloy was used for piano wires.

Ore Sold to Germany

In 1900 the first lot of domestic ore sold at $2 per unit, and was sold to Germany. The U. S. Geological Survey reported that the supply in the United States was greatly in excess of the demand.

During the following five years small quantities were mined, discussions continued as to the value of the metal in steel, but little could be sold, and the principal activity was in Colorado and Arizona.

W. & L. E. Gurley, of Troy, N. Y., standardized on tungsten steel for compass needles because of its constancy. An attempt was made in 1905 to consolidate the tungsten interests of the country, prices have risen to from $5 to $9 per unit, but the isolation of producers and the small quantity of ore produced rendered it unsuccessful.

Experiments began in the making of tungsten filaments for electric light bulbs. The manufacture of pure tungsten was difficult on account of its affinity for carbon and oxygen, which lower its melting point. It was also suggested for use in making crucibles on account of its normally high melting point.

Advance in Price

The price advanced to $14 per unit in 1907, due to the increased use of tungsten in tool steel. There was a serious loss in milling however, a ton of 60% concentrate frequently requiring from 20 to 30 tons of ore. The steel trade was dull in 1908, which reacted on the tungsten market, although many exaggerated claims were heard about the use of tungsten steel for armor plate. The year's production was only 671 tons.

The mines in Colorado led in the resumption of business in 1909, and both that and the following year showed improved production and slightly better metallurgical practice, 1,821 tons of concentrates requiring 20,000 tons of crude ore.

Substantial progress was made in the industry in 1911, although the production decreased. Commercial deposits were found northwest of Nome, Alaska.

Improvements in drawing tungsten wire by the use of diamonds as dies, a hole .0006 inches in diameter being

drilled through the diamond, made possible increased sizes of electric light bulbs.

Tungsten was also used for electric furnaces, electric contacts and X-ray targets, and was considered for use in projectiles.

In 1912, a new alloy called stellite, a combination of cobalt, chromite and tungsten was brought out for the manufacture of high-speed tools. Tungsten superseded platinum for small electric furnaces, and was used for weighting silks.

Colorado continued to lead in the production in 1913. Electric light bulbs with tungsten filament wound in helices and filled with nitrogen, enabled reduction of electric current consumption to 0.4 watts per candlepower, and increased the power of bulbs up to 2,000 candle-power.

Used for Standard

Tungsten was also used for standard weights on account of its hardness, density, and resistance to atmospheric change. Tungsten wire, drawn to .0005 mm. in diameter, is used for galvanometer suspensions, cross-hairs in telescopes, and for surgical operations. On account of its paramagnetic qualities, it is also much in demand for watch springs.

The total production decreased in 1914 but the output of California was phenomenal. It was stated that one hundred million (100,000,000) electric light bulb filaments were manufactured from three tons of tungsten concentrate. New uses were for automobile spark plugs, telegraph relays, gauze for separating solids from acid liquors in chemical laboratory on account of its acid resistance, and for thermocouples used in high temperature measurements.

The war demands of 1915 for high-speed steel ran the price up to $50 per unit, and Colorado and California produced over 2,000 tons, valued at $4,000,000.

The output of 1916 was more than double that of the year previous, the largest ever made in tungsten by any country, valued at over $12,000,000. Old dumps were worked over, prices reached $93.50 per unit, much difficulty was experienced from "high grading" and many stock promotion schemes appeared.

Industry's Birthplace Destroyed

The old Connecticut mill which saw the birth of the industry was burned. Production soon overran the demand, but new operations continued to open up in Alaska and elsewhere throughout 1917.

There was a great increase in Nevada production in 1918, and the U. S. Tariff Commission held hearings at Denver to discuss the question of a tariff on tungsten ore.

One of the year's developments was the welding of a thin plate of high speed

tool steel to an ordinary steel bar, so as to form a cutting edge for a lathe tool. At the beginning of 1919, following the armistice, 65% wolframite ore was selling at from $12 to $15 per unit. At the end of the year similar concentrates were selling at $6 in competition with Chinese ore at $6.50.

From two to three years' supply of concentrates were held and so much scrap was used by tool steel makers that even without the competition of Chinese ore, no sale could have been made of American concentrates.

A demand was made for a protective tariff, and tungsten came under the consideration of the War Minerals Relief Commission.

In 1920 foreign ore sold far below the cost of producing domestic ore, which precluded all business. Congress adjourned before passing a protective tariff bill on tungsten. Chinese ore dominated the market in both the United States and Europe in spite of local Chinese taxes, graft, profits, human porterage over long distances and ocean freights. Two operators in Colorado produced a total of 216 tons. The industry had practically ceased.

The Principal Development

The principal development of the year was a high speed radiographic plate of calcium tungstate, by which exposure was reduced to 1-30 that formerly required.

On account of continued low prices and lack of protection, no appreciable quantity of tungsten was produced in 1921. Thus another industry, naturally indigenous to the United States, ample in quantity and quality to supply its needs, demonstrated the patriotism of its owners and the ability to meet all emergencies of war demand, and fell a victim to the same shortsighted policy which demoralized the graphite and other similar infant industries.

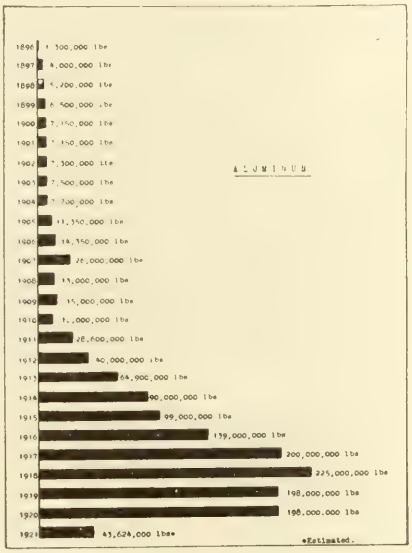
ALUMINUM (AND BAUXITE)

THE PRODUCTION in 1896, approximately 1 1-3 million pounds, exceeded one-half the total of the preceding thirteen years. Much difficulty was encountered in soldering the metal, due to its high conductivity of heat. Experiments were being conducted with aluminum bronze, on account of its resistivity to chemical action and its extreme malleability. The only commercial use, however, was for cooking utensils.

The price which a decade before had been $3.42 per lb., fell to 37½ cents, which, during succeeding years, was gradually reduced. In 1897 the only sources of bauxite were Alabama and Georgia. Much discussion ensued as to the action of sea water on aluminum and its utility for marine construction.

First Separation Efforts

First efforts were made in Canada in 1898 to separate aluminum from corundum. The following year the price of copper was so high that aluminum was substituted for electrical conductors, the Chicago and Northwestern Elevated Railway building twenty miles of 1½-inch cables, weighing 150,000 lbs., for this purpose. Chemical research was devoted to its use as an alloy and as a reducing agent, and as a substitute for magnesium in photographic flashlights.



Bauxite deposits of moment were announced in Arkansas. The entire aluminum development was conducted by one company. But little change took place in output up to 1907, the supply alternately varying from year to year in Georgia and Arkansas.

In 1902 hydroelectric plants were installed at Niagara Falls and Massena, N. Y., and progress was made in the use of aluminum oxide for steel welding. This material was also used as the chief constituent in ammonal, a new explosive.

Attempts were made to import bauxite from France, but the iron contained in the French product precluded its extensive use.

Introduction of Machinery

Developments in Arkansas were materially augmented by the introduction of machinery. Attention was directed to Canadian experiments with the electric furnace. The electrolytic process of separation in 1904 brought the price down to 27 cents lb. A successful aluminum solder was invented; and corubin, superior to corundum because it could be rendered plastic by the addition of clay, increased the consumption of thermit in welding, by its use in the manufacture of crucibles for this purpose. North and South Carolina bauxite deposits were of insufficient purity to affect the domestic supply, which was slightly augmented by importations from France and Ireland.

The development of electrical science caused a slight increase in output in 1905, and in 1906 aluminum to the value of $364,251 was exported to foreign countries. New Mexico, Tennessee, Virginia, Pennsylvania, California and Kentucky announced the discovery of valuable bauxite deposits. The lower grades were used for refractory brick. The high grade bauxite was found only in Cambrian or Cambro-Ordovician rocks in association with faults. In 1907 the output was substantially augmented, due principally to the continued rise in price of copper and tin. A 60,000-volt transmission line of aluminum was built from Niagara Falls to Syracuse, N. Y., and Cleveland, Ohio. The business remained in the hands of a single patentee, and suffered a slight decrease in 1908, due to the financial depression. The motor car industry consumed considerable quantities for crank cases and radiators. Aluminum tubing was used in the manufacture of acids and rubber. Aluminum paint, valuable for its non-tarnishing qualities, also appeared on the market.

Other New Uses

The electric transmission lines of the Southern Pacific R. R. terminals on San Francisco Harbor were rebuilt with aluminum wire; alum was used for sizing paper, and aluminum sulphate was introduced for water purification.

In 1909 American exports were assuming substantial proportions, when an agreement among the European producers expired and the market became demoralized. This was followed a year later by the expiration of the basic patents, with the result that aluminum research work became general. It was found that aluminum tubing was unaffected by stearic acid, which caused its universal substitution for copper in soap and candle factories.

The bauxite production of Alabama and Arkansas increased 200%; and Italian aluminum became a distinct competitor. In 1911 a new type of furnace was patented and installed at Clarksburg, W. Va., and aluminum was in much demand for airship construction. Its use as a substitute in combination with silk for ceremonial and theatrical costumes was followed by the production of calcium aluminate to give a quick set to plaster. Deposits of alunite in Utah gave rise to experiments for the production of aluminum from it.

During the following two years a consolidation was effected between the French, Swiss and American aluminum interests and the acquisition of a water-

power site in North Carolina was attempted. This was interrupted later by the European war and the project was taken over by the Aluminum Company of America.

The continued high price of tin brought about the substitution of aluminum foil for tin foil, and steel reinforced aluminum cables for transmission lines replaced many miles of copper wire. New uses were constantly found for the product, such as storage tanks for oils, syrups and esssences, shoe soles for workmen employed in damp places and sea water resisting alloys.

Lead Taken by United States

In 1914 exports exceeded 1½ million dollars, and 80% of the domestic bauxite supply came from Arkansas. In 1915 the United States led the world in the production of metallic aluminum, with exports in excess of 3½ million dollars. The Arkansas output reached 90 percent of the total, and a year later the production of metallic aluminum increased 117 percent. War demands stimulated the price to 65 cents a lb., and many methods were devised to utilize scrap, while previously unprofitable operations were reopened.

On March 5, 1918, the industry passed under government control with the price fixed for 98-99 percent pure aluminum at 32 cents a lb. in lots of 50 lbs. or over. June 1st this was raised at 33 cents a lb. This was the year of maximum production, 225,000,000 lbs., large quantities of aluminum sulphate going into water purification, and of aluminum chloride for the refining of oils.

A slight decrease in output took place in 1919 and 1920, but the expanding automobile industry furnished a substantial market. Considerable quantities of bauxite were exported to Canada.

Bauxite Abrasives Introduced

The Bureau of Mines carried on experimental work on losses during remelting, and many bauxite abrasives appeared on the market under various trade names, in the form of powders, cloths, grinding stones and wheels.

The expansion of plant capacity wherever hydroelectric power was available resulted in the development of the aluminum industry at Great Falls, Mont., and in California. During 1921 the curtailment in the use of aluminum by the automobile industry brought about a decrease in price which gradually dropped from 28 cents to 20 cents a lb., while exports decreased from 9,500,000 lbs. in 1920 to approximately 2,000,000 lbs in 1921.

BARYTES

Barytes

THE BARYTES industry for many years had been carried on as a side line during dull times by Missouri and Virginia farmers. The nominal production began to decline in the early 90's and in 1896 was only 17,068 tons. Its principal use was as a pigment and substitute for white lead. Many objections were raised to its use in paint on the ground that it was an adulterant and not a substitute. These objections, as well as the competition between Eastern and Western producers, depressed the market and the industry was virtually suspended.

Canadian Ore Treated

A barytes mill was built, however, at West Superior, Wis., to treat the ore from a Canadian island in Lake Superior. In 1897, 40 percent of the supply in the United States came from Missouri, and 50 percent from Virginia, North Carolina and South Carolina.

BARYTES MINING IN GEORGIA

This open-cut operation of the Paga Mining Company, Cartersville, Georgia, is carried on in residual clay. The ore is washed in special types of iron ore washers, after which it is jigged and concentrated

By 1901 markets had been found for the use of barytes in sizing paper, in the manufacture of rubber, and for coating canvas sacks enclosing hams. Extensive deposits were opened up in Tennessee and Missouri, which latter state still leads in production, and small importations began to come in from Germany as ballast.

The year following, deep deposits were opened up in Virginia, and efforts were being made to utilize barytes in the manufacture of glass, but without success.

A new deposit was discovered in New York in 1904, but values continued to decline and German importations increased. Chemists maintained that barytes was an addition to rather than an adulterant of white lead, and therefore a valuable adjunct to the paint industry. It appeared that barytes gave a permanent white, unaffected by the weather, gases, or acids, and, as a result, commercial efforts were made to increase the use of light-colored paints in order to improve the industry.

In 1906 Alabama entered the field as a producer, and deposits were also found in the Cumberland Valley in Pennsylvania.

Up to 1901 barium scrap had been on the free list. In November, 1901, it was made dutiable. This was shortly after set aside, but in April, 1906, the Treasury Department ruled that precipitated barium was dutiable under the act of 1897. The addition of a duty produced an immediate revival of the industry, and the early part of 1907 saw great activity all over the country in the production of barytes.

The industrial depression which began in the Fall of that year, however, caused many mines to shut down, with large reserves on hand. Precipitated barium carbonate was used in analytical chemistry, and also to impart lustre to glass. The stocks on hand were more than sufficient to supply all requirements until 1909, when business saw a slight improvement. There were 28 operators in Missouri, but only one or two in each of the other producing states. The capacity of both mines and refineries was greatly in excess of the demand.

Chemical Tests Continued

The chemical tests referred to in 1904 were continued over the five-year period with various pigments under varying climatic conditions, and resulted in standards of mixture for white lead, zinc, and barytes. It was determined that a mixture of not exceeding 15 percent of inert pigments was advantageous, and that a mixture of barytes and "blanc fixe" permits advantage to be taken of the difference in size of particles, based on the fundamental principle that a paint coating consisting of three sizes of particles is superior to a film containing only one or two sizes of particles.

This demonstration of the legitimate place of barytes among pigments stimulated the industry, and the Payne-Aldrich bill increased the duty on crude barytes from 75 cents to $1.50 per long ton. This protection, however, was so small that in the following year (1910) importations increased 91 percent and domestic production decreased 30 percent.

New uses were in the manufacture of wall paper, for asbestos cement, for tanning leather, and as an external coating for cheese to prevent aeration.

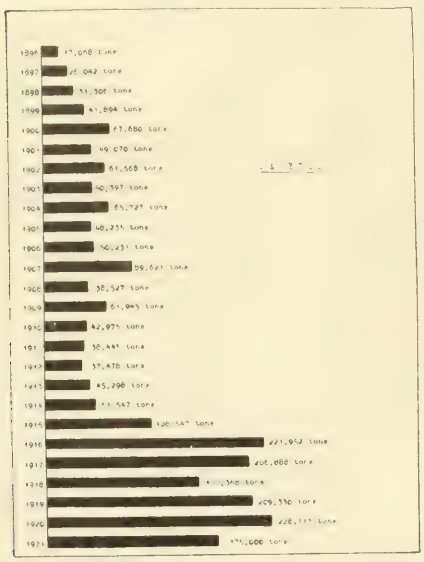
Until the outbreak of the war the industry led a precarious existence, and a continuous fight against imports. When these were cut off, due to lack of shipping, domestic producers made earnest

efforts to meet the demand. Samples were shipped in from Alaska for experimental purposes, operations were opened up in Nevada, and Georgia led in output, superseding Missouri and Colorado. The output in 1916 was 104 percent over that of 1915. The principal markets were St. Louis and Philadelphia, but car shortage and railroad embargoes created difficulties for shippers in South Carolina and Tennessee, which led to the building of lithopone and barium chemical plants in the southeast.

Handicap to Marketing

Continued car shortage in 1917 made it impossible to market the product, with the result that prices rose 16 per cent.

Nineteen eighteen added New Mexico and Wisconsin to the sources of ore,



German supplies being wholly cut off, and the chemical industry started in 1916 in Georgia, Tennessee, Kentucky and West Virginia made substantial growth, the production of Georgia exceeding Missouri by 20,000 tons.

About one-third the total production was ground, floated or otherwise refined and used for paint. One-half was made into lithopone, the remaining one-sixth into barium chemicals. There were fifteen plants engaged in the manufacture of lithopone, of which 78 percent of the manufactured product came from Philadelphia.

Importations were resumed in 1919 and the price continued high on account of increasing demand.

In 1920 the value of the domestic product exceeded $2,000,000, of which 80 percent came from Georgia and Missouri. There were 94 mines active and two new lithopone plants were built.

In one county of Georgia alone over $1,500,000 was invested in barytes mines and mills.

In 1921 nine states were actively engaged in the industry. Among the additional uses developed were in the distillation of hydrogen peroxide as a neutralizing agent for sulphur in the manufacture of brick, as an X-ray detector for surgical photographs, in the manufacture of battery plates, and for munitions.

It appears, however, that no real prosperity can be expected for American barytes without adequate tariff protection, since the cost of labor remains abnormally high in comparison with that of Germany, our principal competitor, and also because the German deposits lend themselves especially to ballast transportation.

CHROMITE

CHROMITE WAS discovered in Maryland in 1827 and was used in the manufacture of pigments. Previous to 1916, the largest production in the United States was 3,680 tons in 1894. The year of highest value of production, however, previous to 1916, was 1883, when the Maryland product was valued at $60,000.

Some Early Exports

Before the civil war a considerable amount was exported, but the discovery of chromite in Asia Minor and New Caledonia (a French possession East of Australia) led to importations and an entire cessation of domestic production. In 1900 a few tons were taken out in California as samples, but lack of reduction plants on the Pacific Coast precluded development. During the succeeding 7 years small quantities were mined in California and used for experimental furnace linings.

In 1905 a deposit was found in North Carolina but it was so remote from the railroad as to be unavailable. Imported ore was used exclusively for the manufacture of chrome steel. On account of the high fusing point of the metal itself, and its tendency to float, it was found advantageous to use the ferro alloy. The principal production was by electric furnace at Kanawha Falls, W. Va.

Chromite brick was used as a neutral, and in the back part of uptakes in furnaces, to prevent the action of slag coming over in the form of cinders.

There being no tariff on imported ore, the small tonnage of California was still further decreased. In 1908 chromic iron ore was discovered in Pennsylvania, Massachusetts, North Carolina, Wyoming and Oregon.

In addition to furnace linings, chromite was used for pigments, dyes, bleaching agents, tanning, and steel alloys. The price varied from $10 to $20 per ton according to quality. Imported ore sold at $17.50 to $20 per ton. From 1909 to 1911 small quantities continued to come from California and Wyoming in varying quality, but no progress could be made to establish the industry on account of foreign competition.

New Mines Opened

In 1912 two new mines were opened in California, but the total production for the year was only 201 tons. Increased hydroelectric power enabled the development of electric methods of producing ferrochrome by passing an electric current through a slag register adjacent to a charge containing carbon and combined iron and chromium.

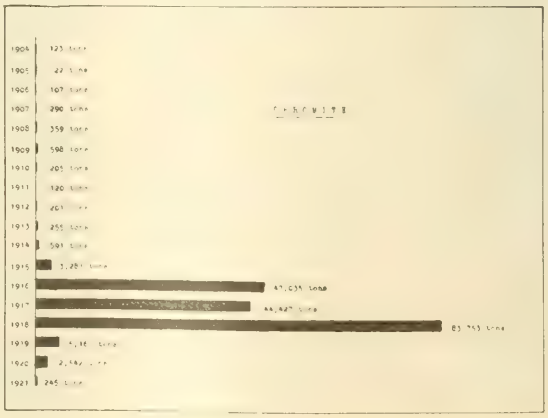
The following year the use of chromium carbide for arc light electrodes was patented. Experiments were being conducted to determine the fusing points of the chromite compounds. Chrome steel became so useful for armament that its price was quoted by the pound instead of the ton. This rise in price brought a slightly increased production in California and Maryland. Chromite deposits were discovered in Alaska and it was predicted that the Panama Canal would enable the Pacific Coast deposits to meet foreign competition.

In 1915 the war caused all foreign contracts to be abrogated and for the first time since 1894 a sizeable production, amounting to 3,281 tons was reached.

In January, 1916, the Southern Pacific, Santa Fe and Western Pacific Railroads announced a reduction in freight rates on chromium from California points to points east of Chicago from 75 cents to 55 cents per 100 lbs. in carload lots. As a result California output increased 1,400 percent, with royalties ranging from 50 cents to $7.50 per ton. Deposits in Oregon were also developed.

Conditions Remain Unchanged

Conditions changed very little in 1917, other than trouble with irresponsible producers over low grade ores. Alaska, Washington and North Carolina supplied a limited amount. The high grade ores

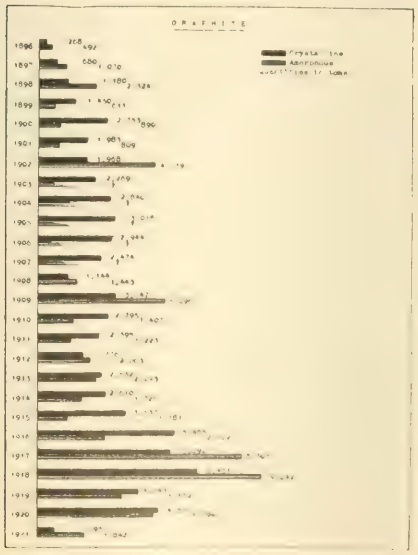


were used for metallurgical and chemical purposes, and the low grade for ferro alloys. A slight decrease in production occurred due to irregular car supply. Nineteen hundred and eighteen was the banner year. Output jumped to 83,753 tons, stimulated by prices ranging from $10 to $50 per ton. In March a large consumer issued an appeal for chromium and guaranteed $47.50 for 38 percent ore. Thus, an industry only 4 years old so far as active production was concerned, jumped to an output valued at $4,000,000. Among the developments requiring ferrochrome were stainless steel for cutlery, and drill proof steel for safes. The sudden prosperity of the industry led to active prospecting, and Montana joined the group of producing states. The end of the war, however, left the producers with large stocks on hand and importations resumed.

Nineteen hundred and nineteen saw production drop back to 5,161 tons and in 1920 to 2,542 tons. Out of 39 shippers in California over 20 closed down. It became necessary to ship only concentrates on account of high freight rates, many of the mines being handicapped by lack of concentrating equipment, and it became evident that not even the Panama Canal transportation could save the industry. Nothing but tariff protection and reduced freight rates would permit competition with foreign ore selling at 33 1-3 percent below the present cost of domestic ore. Nineteen hundred and twenty-one marked the temporary cessation of the industry with an output of 245 tons of 50 percent ore, from the only 3 operations working, in California and Oregon. During the same period 81,836 tons were imported.

GRAPHITE

THE DEVELOPMENT of the graphite industry is a fascinating story. Twenty-five years ago an annual output of 760 tons was an event.



The New York graphite was used for pencils, crucibles, lubricants and paints. The Rhode Island product went principally into paints and roofing materials, while the Michigan supply was used exclusively as a pigment.

The following year exploitation started in North Carolina and Texas. The principal imports were from Germany, Italy, Austria-Hungary and Ceylon, with small amounts from Canada and Mexico.

In 1898 the domestic production of crystalline graphite was the largest on record, coming principally from Ticonderoga, N. Y. The Acheson Graphite Co., at Niagara Falls, began to produce artificial graphite, and much experimentation was carried on with its product. The domestic production increased 25 percent in quantity and 100 percent in value, in 1899, and the Acheson plant was enlarged. Notwithstanding this, over 8 times the domestic production was imported.

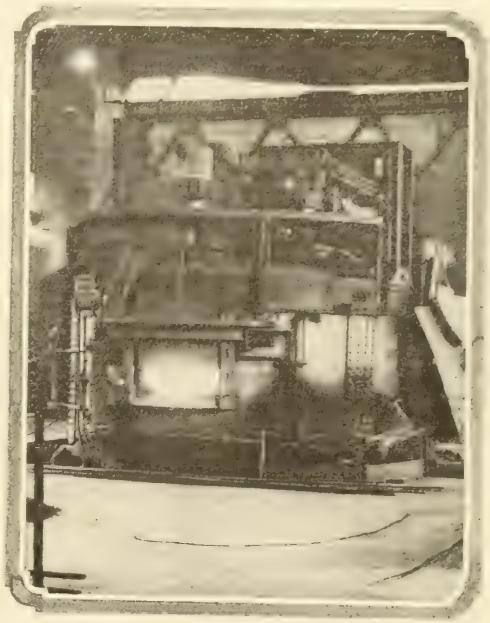
Wisconsin was added to the sources in 1900, and Ceylon remained as the principal source of imported graphite. The increased proportion of amorphous graphite used in 1901 brought the average price per unit value from 8 cents to 4¾ cents per lb. Domestic deposits were found in Montana and Wyoming, and in 1902 the increased proportion of lower grade graphite thrown on the market lowered the average price. The Acheson plant increased its output and cut the price of its product. Dry batteries, commutator brushes, and electroplating work all made demands for the product. These increased uses amounting to 1,000 percent caused the U. S. Geological Survey in 1903 to investigate many deposits called to their attention. They pointed out, however, the difficulties to be encountered in cleaning and refining the product and cautioned against undue expenditures without due research.

This activity caused prospectors in Maine, New Hampshire, Georgia, Ohio, Arkansas, South Dakota, Colorado, California and Nevada to report workable deposits. Crucibles, retorts, pencils, steam packing, paints, electrical supplies and lubricants all made their claims of superiority because of their graphite base in 1904.

New Uses Discovered

The manufacture of artificial graphite by the Acheson Co. increased to 4,500,000 lbs. in 1905. The following year Director Smith, of the U. S. Geological Survey, pointed out the similarity in appearance between the crystalline flake graphite and molybdenite, which differ

only slightly in color. Molybdenite being a sulphite and graphite a pure carbon, a simple blow pipe test will serve to distinguish them. Dr. Smith also stated that the characteristics which unfit flake graphite for use in pencils make it especially adapted as a lubricant. Stove polish was added to the graphite prod-



A TRIBUTE TO INVENTIVE GENIUS

This 30 ton Heroult electric steel furnace operates with 12-inch Acheson Graphite electrodes, which are not only superior to those made from natural graphite, but to whose development the success of the electric furnace is due.

ucts; Idaho to the sources. About this time the Acheson Co. developed a process of treating artificial graphite with tannin, making a deflocculated graphite which may be used in either oil or water.

In 1907 there were seventeen producing companies in ten states and territories. The flake graphite came from New York, New Jersey and Pennsylvania, the balance being amorphous. Announcement was made of extensive deposits of high grade flake graphite 40 miles Northwest of Nome, Alaska. The output of the Acheson plant was greater than the total output of flake graphite in the United States and of greater value than the combined production of flake and amorphous graphite.

There was little change during the next two years. The use of graphite as a lubricant was increasing rapidly, and a large diversity of product, graded according to texture and hardness, was being brought out by competing firms. New uses were as a harmless glaze for tea leaves and coffee beans to protect them against moisture. The output for 1910 was 4½ times that of 1909. Domestic

flake graphite began to replace the Ceylon product in the manufacture of crucibles.

It was stated by the U. S. Geological Survey in 1911 that the principal cause of irregularity in graphite mining in the United States was due to inability to compete with the cheap labor of Ceylon, which permits cheap mining, careful sorting, rubbing up and blending up the product. The diversity of the American graphite deposits and the small margin of profit when unprotected against importations, tended to restrict experimentation in concentration.

In 1912 importations were received from Madagascar and on account of there being no tariff, production greatly decreased. The uses of graphite were given in 1913 as follows:

	Pct.
Crucibles	55
Stove polish	15
Foundry facings	10
Lead pencils	5
Paint	5
Lubricants	5
Miscellaneous	5

From the standpoint of quality and value, crucibles would be 75 percent.

Nineteen hundred and fourteen saw the beginning of the flake graphite industry in Alabama. Imports decreased due to shortage of bottoms and increased ocean freight rates. In October, Ceylon declared an embargo against the export of graphite to all except English ports, which action was followed by Madagascar. Many local deposits were reopened in an effort to supply the deficiency.

The number of electric steel furnaces having increased 78% in the United States, the demand for graphite electrodes was insistent. In 1915 the Acheson Co. put out electrodes ranging in size from 1/16″ to 12″ in diameter and up to 77″ long. The field of the electric furnace is in that of temperatures from 2,000°-3,000° C., with a probable maximum of 4,000° C. Two general types have been developed, the arc furnace and the resistance furnace. In either case the operation is based on the transformation of electricity into heat. The development of hydroelectric power with costs ranging from $5 to $60 per kilowatt-year will mean a rapid increase in the installation of electric furnaces and a corresponding call for huge graphite electrodes.

A Rapid Expansion

By 1916 the great increase in the manufacture of brass called for a corresponding increase in crucibles. The supply of crystalline graphite was met by a rapid expansion of the industry in Alabama, New York and Pennsylvania, with small quantities from California, Montana and Texas. The total production was 55 percent over that of 1915. High ocean freight rates decreased the imports from Chosen, and the closing down of many mines in Mexico lessened the supply of amorphous graphite. It was estimated that $4,000,000 was invested in equipment in the flake graphite district of Alabama alone, and elaborate flotation plants were installed, in order to make the Alabama production equal to the best imported graphite.

It was found that when the American clays and flake graphite were properly prepared, crucibles made from them gave superior results to those made from the best Ceylon product.

The perfection of artificial graphite electrodes in 1917 brought about a further increase in the manufacture of electric furnace steel equal to eight times the total of crucible steel and one-eighth that of Bessemer steel. Many graphite products were placed on the restricted list by the government, due to the war. The profits in the industry being confined to No. 1 and No. 2 flake, the dust and lower grades become by-products. Oil flotation reached a high degree of efficiency in flake production. It was estimated that if Madagascar graphite could be put in the London market for 4 cents a lb. under normal conditions it would stifle the American graphite industry without a protective tariff.

Restriction of Imports

In 1918 in order to conserve shipping imports were greatly restricted, with the result that domestic producers furnished a 22 percent increase over previous tonnage. Crystalline graphite was developed in Montana and flake graphite in California and Texas, the bulk, however, still coming from Alabama, New York and Pennsylvania. The selective draft and an abnormal shortage of labor handicapped Alabama, which state nevertheless continued to improve the quality of her product.

Crucible manufacturers were requested by the War Industries Board to use 20 percent domestic flake the remainder of the year and 25 percent the following year.

Late in 1918 the Acheson Co. perfected a method whereby satisfactory crucibles could be made from the artificial graphite. Experiments in conservation led to the recovery of graphite from "kish," a mixture of graphite, slag, iron oxide and other materials which accumulate around a casting ladle or Bessemer or open-hearth furnace, consisting of crystallized excess carbon from molten pig iron. The graphite is recovered by screening and treating with magnetic separators. Old crucibles were also treated by crushing and using oil flotation. Electric furnaces continued to increase and it was predicted that the time was ripe for the elimination of crucibles in the brass industry.

Attempt at Standardization

Among the utilizations of graphite were in the colloidal form to reduce the amount of lubricating oil; for coating vessels' bottoms to reduce friction and rust; and added to impure water to loosen old scale and prevent new.

Notwithstanding the business depression of 1919, Alabama led the graphite industry. In 1920, however, the demand for crucibles fell off, and flake graphite became a surplus, the price falling below the cost of production. The post-war demand was less than the proved capacity of plants in operation in 1917-1918. The Graphite Association attempted to standardize the American product, which came principally from Alabama and New York.

In 1921 sales fell off 74 percent in quantity and 85 percent in value, amounting to stagnation in the industry. Only a few of the best equipped plants attempted to operate. Manufactured graphite also suffered, but the increase in the use of the electric furnace created a growing demand for electrodes.

The industry was also dead in Ceylon and Madagascar, but with enormous stocks on hand, shipments were made to the United States and unloaded at prices barely covering the cost of freight. As a result, unprotected by any tariff, the adequately equipped plants of the industry in America lay closed, while the product of cheap labor abroad was dumped in our warehouses. Again the mining industry gives evidence of its ability to serve the utmost requirements of the country when adequately protected. In passing, the growth of the Acheson Co.'s plant at Niagara Falls is worthy of note. Starting with an output of 405,870 lbs. in 1899, their production steadily increased to 37,891,713 lbs. in 1918, and an estimated production of 15,000,000 lbs. in 1922.

Uses of Artificial Graphite

This includes powdered graphite and electrodes, plates and anodes made up in carbon form and later transformed into solid pure graphite by the electric furnace process. The uses are given as: Graphite powders, dry battery filler, paint pigment, electric furnace resistors, electrotypers' leads, powder glazing, manufacture of molded mechanical rubber goods, mold wash, rope lubricant and the special Acheson lubricants known as Gredag and Oildag. Solid graphite—electrodes, anodes, blocks and plates for casting non-machinable metals, laboratory crucibles, resistor units and contacts. The relation of production between solid graphite articles and graphite powders is about 4:1.

MAGNESITE

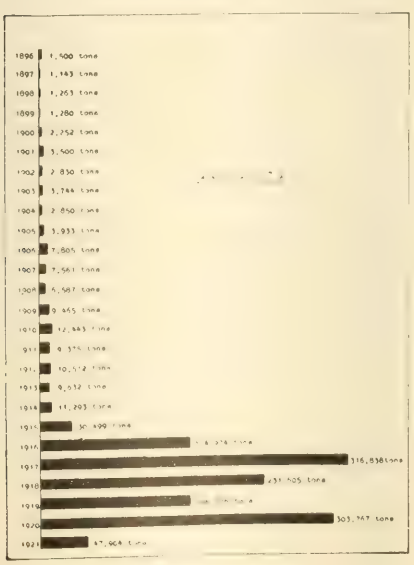
THE PRODUCTION of magnesite in California began in 1891 but amounted to very little until 1915. The entire output was under the control of one firm and was used in the manufacture of carbon dioxide gas by calcination, the calcined product, magnesia, being sold to paper mills.

In 1892 importations of both crude and calcined magnesite and of magnesite bricks were made from Greece and Austria. Ten years later (1902) the manufacture of Epsom salts from magnesium sulphate consumed 25 tons per year. The use of carbon dioxide gas for charging mineral waters and in refrigeration was rapidly increasing. As the steel industry grew, the demand for magnesite bricks used in lining furnaces and convertors increased.

A Slight Increase

In 1903 its use as a bleaching agent added to the demand and California output showed a slight increase. Greece still led Austria as a source of importations which continued to grow on account of the prohibitive freight rates on California product. Added uses were as an insulating covering for steam pipes, as artificial lumber, and as composite stone for lithographing. It was estimated in 1904 that from one ton of crude magnesite there were recovered 1,200 lbs. of calcined magnesite, and 500 lbs. of gas which was then compressed into liquid form at a pressure of 850 lbs., the process of calcining requiring 500 lbs. of coke. Deposits were also discovered in Massachusetts, Maryland, and Pennsylvania, but were not developed.

Experiments were made in 1905 with magnesia as an adulterant for paint, but its use was abandoned, due to its tendency to settle to the bottom. Only two out of fifty known deposits in California were operated, due to lack of transportation facilities, and high freight rates which prohibited eastern sales. A magnesite brick plant was built on San Francisco bay, the first in the West, but the earthquake of 1906 severely damaged it and it was not immediately rebuilt. Additional deposits were located in California but absence of roads and railroads made development difficult and competition with imported magnesite prevented extensive operations.



After the San Francisco earthquake many sources of supply closed down. A factory was erected in Los Angeles to manufacture ornamental wainscoting, table tops and tiling.

Efforts to secure a tariff on both crude and calcined material were unavailing. A duty of 25 percent ad valorem f. o. b. foreign ports was placed on magnesite brick, but this was not sufficient to offset the high freight rates from California. The price of crude magnesite rose 33 1-3 percent in 1909, so that California operations not too remote from the railroad were able to operate. Importations of crude magnesite decreased, but those of calcined magnesite increased.

The Situation in 1910

In 1910 nothing but calcined magnesite was marketed, the calcined product being approximately one-half the weight. Most of this went into the wood pulp and paper industry in California and Oregon. The calcined product was used for fireproof flooring and tiling, drain pipe, ornamental door, sash and window trim, and for fireproof paint. Another new use was as flooring in steel railroad cars. The fines were used as a substitute for oyster shells at chicken farms. Interest in the Panama Canal led to considerable prospecting in 1911. Experiments were made with magnesite as a binder for briquettes, to prevent scale in sulphurous boiler water, and as an absorbent in the manufacture of dynamite.

The following two years the industry was stagnant. Only three plants were in operation. The first influence of the war in 1914 was to stimulate trade, and large importations were brought in to accumulate stocks. Shortage of bottoms caused the withdrawal of a recently issued freight reduction through the Panama Canal. New uses continually developed, among them as a fire proof paint, and as a dry powder to be mixed with cold water and sprayed for fireproofing and damp-proofing curtains.

In 1915 the California output jumped to 30,499 tons, in an effort to supply the shortage caused by the war. Many operations having no furnaces for calcining, shipped crude ore across the continent. Owing to lack of bottoms practically no ore was shipped through the Canal.

Domestic production increased over 500 percent in 1916. New deposits were opened up in Stevens Co., Washington, thus adding a state to the commercial resources of the industry, hitherto confined to California. The Washington magnesite closely resembled the best of the imported product and rapid development took place.

A MAGNESITE MINING OPERATION

This mine, which is the largest and best of its type, is operated by the Northwestern Magnesite Company at Chewelah, Wash.

Railroad embargoes in 1917 caused much difficulty in delivery, but 316,838 tons were produced and all consumed. Automobile trucks were used to transport both crude and calcined product to the railroad. Over 100,000 tons of the year's output came from the new operations in Washington. Another illustration was thus given of the ability of the country to produce essential requirements when properly protected, the war embargo on shipping amounting to practically a protective tariff. Steel plants declared that the western product was wholly satisfactory.

Freight Rates a Factor

Freight rates added so materially to the delivered cost, however, that consumers demanded calcined product. Many producers not being equipped with kilns were therefore obliged to close down. This, and irregularity in the steel industry, with shortage of labor, caused the annual production to drop to 231,605 tons in 1918.

The following year imports decreased 24 percent, and only one plant remained in operation in Washington. A bill was introduced before Congress providing for a protective tariff but was not

passed. The capacity of the Pacific Coast plants was sufficient to provide for the entire national requirements to provide a surplus for export, but a protective tariff and favorable freight rates were essential to meet competition.

Business picked up again in 1920, the use of magnesite as flooring in army camps and on transports having called the material to the attention of builders everywhere. Output increased 120 percent in value, aggregating 303,767 tons. Importations also increased with the inevitable result, that the three plants which had reopened in Washington were again compelled to close down for want of a protective tariff.

A Five-Year Relapse

Nineteen hundred and twenty-one saw the industry back where it had been six years before. The California product was calcined for plastic use. Refractory consumption was supplied from abroad. Many new uses were added, such as built-in bath tubs, laundry tubs, burial vaults and caskets, cold storage and fireproof vaults, vases and garden benches, and glazed tiling for refrigerators.

The supply is such that the most conservative must admit an abundance within our borders. The future of the industry depends on the decision as to whether European industries shall be maintained at the expense of our own.

MOLYBDENUM

ALTHOUGH KNOWN to exist, and its qualities recognized, Molybdenum had not been developed, due to fear on the part of consumers of an irregular source of supply, and on the part of producers, who doubted a regular market.

Its original use was in the manufacture of chemical reagents, especially in the coloring of porcelains. In 1899 its properties as a steel alloy began to be appreciated and in 1901 its use in ferro-alloys made it a competitor of tungsten. In 1903 about one and a half million pounds of concentrates were recovered from sluicing tailings at a cyanide mill in Mammoth, Ariz., with small quantities from Chelan County, Washington, and Cooper, Maine. Owing to the uncertainty of the value of molybdenum concentrates many properties remained undeveloped. Wulfenite was discovered in Arizona and a mill erected. Prices for ore ranged from $100 to $3,000 per ton.

Small Lots Marketed

A few small lots were marketed from Washington, Montana and Arizona during the next ten years, and from New Mexico in 1914. Colorado deposits were opened up in 1915 and a few additional ones in Arizona and New Mexico, so that in 1916 the production amounted to 206,740 lbs., valued at $205,000.

During the following year it was found that wulfenite or molybdenite exists in almost every state in the Union where large outcrops of granite are found. The output again doubled, its value being $495,350.

WHERE MOLYBDENUM IS MINED

The town of Climax, Colorado, has grown at the foot of this mountain, where the operations of the Climax Molybdenum Company form the largest plant of its kind in the world.

In 1918 the center of production moved from Arizona to Colorado, due to the great size of the Colorado deposits and the large mills with their increased tailings. Two elaborate mills were built in Colorado at an altitude of 12,000 feet, and the output again doubled in quantity, valued at $1,253,700. It was considered that the United States had the greatest available molybdenum resources in the world.

A Poor Market

In 1919 there was a poor market and most of the companies closed down, selling stocks on hand amounting to 297,926 lbs. By 1920 the market had dwindled and only one operating mine was recorded, its output being valued at $17,207.

For high-speed tool steels and increased ductility and toughness, molybdenum is recognized as high in the rank of alloys. One of the remarkable developments in its use is the manufacture of alloy armor plate during the war whereby American steel manufacturers furnished turret and gun protectors ranging in thickness from one-quarter to five-eighths inch, affording ample protection to men and guns, and greatly reducing weight and increasing space in tanks and airplanes. It seems likely that with the increase in aviation and the recovery of the steel industry molybdenum will continue to play an important part in the mineral industries of the United States.

The development of molybdenum, which is most substantial, has taken place in the last two years. Its great value as a low percentage alloy in steels to give them high tensile resistance has made possible the introduction of molybdenum into large tonnage and steel production, such as automobile frames, axles, bridge steel and similar uses.

NICKEL

THE GAP MINE in Lancaster County, Pennsylvania, was one of the largest producers of nickel in the world from 1863 to 1888. Its operation, however, was discontinued, due to the large quantities of nickel matte shipped into the United States from Canada.

The only working source of cobalt or pyrrhotite in the United States in 1896 was at Mine la Motte, an important lead mine in Missouri, where a limited amount of nickel was made as a by-product. Traces had been found in North Carolina, Nevada and Oregon, but of too low grade to warrant exploitation.

At this time the acid purification process was being superseded by the soda process, and experiments were being carried on with anodes of nickel oxide slabs in electrolytic separation.

The First Uses

The uses of nickel were in the manufacture of German silver, as plating to avoid rust, for coinage, for rolled plate as a substitute for tin, as an alloy of steel tubing used in the construction of bicycles, as wire for the support of gas

mantles, and for electrical resistance coils. Efforts were made during 1898-1899 and 1900 to develop local deposits in Oregon, Washington and Idaho. The demand appearing promising, the Gap mine in Pennsylvania was reopened.

In 1901 nickel was reported from Ketchikan, Alaska, prospecting continued in Idaho, and a few North Carolina deposits were worked. The Western ores, however, were too remote from the railroad to be developed.

Arsenate of copper, nickel and cobalt from the Mohawk mine in the Lake Superior district were first successfully treated in 1902. Nickel steel rails and wire rope came into use and a few carloads of ore were shipped from North Carolina.

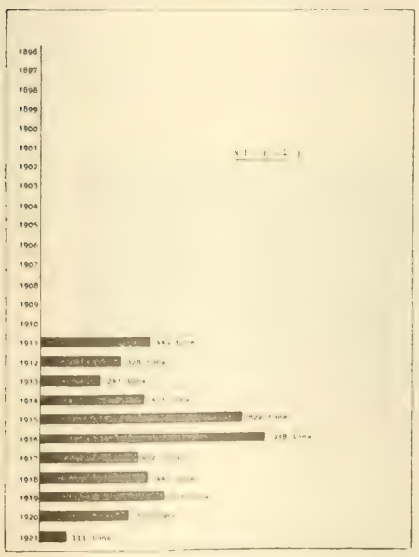
In 1903 the Pennsylvania Railroad made a five months' trial of nickel steel and carbon steel rails on the Horseshoe Curve. It was estimated that on sharp curves a nickel steel rail, due to its abrasive resistance and higher elastic limit, would outlast four ordinary rails.

Nickel steel was also largely adopted for forgings in large marine engines, parts of locomotives, sea-water pumps and wire cables. Its high tensile strength and elastic limit and its high permeability at high inductions made it in great demand for electric apparatus.

Valuable Electrical Resistance

The high electrical resistance of nickel steel with its low temperature coefficient make it valuable for electrical resistance work, the main objection being mechanical defects in the wire. Investigations were carried on in the use of nickel steel for rock drills and rock working machinery subjected to repeated and violent shocks.

New uses were in wet mines, torpedo defense netting, electric lamp wire, umbrella wire, corset wire, armored glass, mounting of lenses, mirrors, balances for clocks, weighing machines, etc., where a low coefficient of expansion is desired, and for tubes in marine boilers on account of their longer life and resistance to rust, the higher elastic limit of nickel steel preventing leaks in boiler tubes. It could well be said that 1903 was the year in which nickel came into its own.



During all this time, however, the production in the United States was desultory and the main supply was Canadian matte. In 1904 nickel steel knives, which retained their cutting edge, were introduced. In 1908 electrolytic nickel was produced at Fredericktown, Mo., Bunkerville, Nev., and Chrome, N. J.

A new alloy known as Monel metal, consisting of 68 percent nickel, 1.5 percent iron and 30.5 percent copper, was put on the market to compete with nickel steel. Having a greater tensile strength and higher elastic limit than rolled steel, it was used for condensers, boilers, cast propellers, etc.

Ever since 1901 the United States had refined more nickel from Canadian matte than it consumed, so that a substantial export business had been built up.

Plant in North Carolina

A large plant was built in North Carolina in 1909 for the reduction of silicate ores to make ferro-nickel-silicon. Monel metal grew in favor during succeeding years, especially for valves, where bronze softens and gives way.

Nineteen hundred and twelve saw the culmination of a number of chemical and metallurgical experiments in nickel. Added recoveries were made from blister copper. Mixed ores from the Rocky Mountain district yielded ½ of 1 percent nickel; ores from Alaska 4-10 of 1 percent.

Invar, a new compound of nickel and iron having an almost negligible coefficient of expansion, was used for engineers' tapes, watch springs, pendulums, and instruments of precision. Nickel salts were also used for the hydrogenation of oils, especially in the reduction of cottonseed oil to a solid as a cooking fat. They were also used for the deodorization of petroleum.

Electrolytic refining of copper had advanced to such a stage in 1914 that 845,334 lbs. of metallic nickel were saved as a by-product.

The closing down of many Canadian plants and smelting operations and consequent cutting off of nickel matte importations into the United States brought a demand for a practical test for nickel ore, which was issued by the United States Geological Survey.

When the survey of war minerals was made in 1915, nickel was reported in commercial quantities in California, Colorado, Connecticut, Idaho, Missouri, Nevada, New Mexico, North Carolina, Oregon, Pennsylvania, Virginia and Washington. Great excitement was caused in 1916 when the German submarine "Deutschland" took two cargoes of which nickel formed a considerable part, indicating its importance to Germany at that time.

A UNIT OF THE NICKEL INDUSTRY

Rolling Mill of the International Nickel Company, at Huntington, W. Va. Here vast quantities of nickel product are shaped and distributed for world shipment

New Electrolytic Plants

In 1918 several new electrolytic plants were built and starting in operation when the armistice terminated the demand for armor plate, bullet casings, etc. The industry, therefore, reverted to minimum requirements.

Cobalt ores were mined in Idaho and Missouri in 1919, but little change took place in market conditions.

In 1920 and 1921 by-product production continued to decrease and importations of matte increased, leaving the usual margin for exportation. The old operation at Fredericktown, Mo., had no output in 1921. Canada and Finland were replacing small silver coins with nickel. The largest rolling mill of its kind in the United States was erected at Huntington, W. Va., by the International Nickel Co.

Pyrites

PYRITES

THE YEAR 1896 opened with an advance in the price of imported sulphur, which encouraged the use of pyrites in the manufacture of sulphuric acid, and many furnaces were changed from sulphur to pyrites burners. Massachusetts, Virginia and North Carolina were the source of domestic supply, although prospecting for pyrites was being carried on in Arkansas.

So rapidly did this change take place that the following year the production of pyrites was 143,201 tons, and it was recognized as a formidable rival to sulphur. Sixty percent of the product was granular fines, which required special furnaces to handle them. These furnaces, of 25,000 lbs. capacity, cost $3,000, and it was predicted that granular ores and mechanical furnaces would supplant lump brimstone ore and shelf furnaces.

An Increased Demand

The Spanish War in 1898 created an increased demand for sulphuric acid, which reacted on the pyrites industry, due to the shutting off of Spanish pyrites. Colorado, Ohio and Tennessee joined the producers.

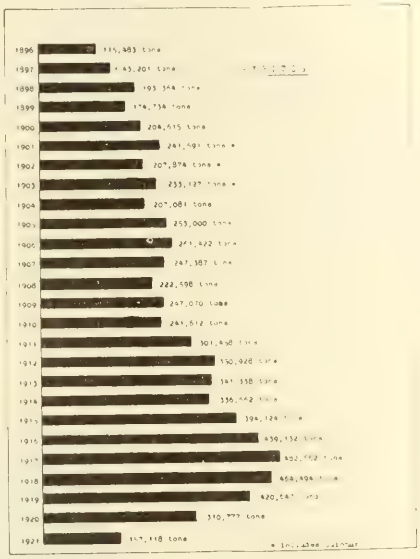
Two years later the price jumped to $3.67 per ton, and both production and imports broke all records. The development of the sulphide wood pulp industry for the manufacture of paper, and the growth of the phosphate rock industry in Florida and Tennessee, together with the domestic manufacture of superphosphates, all created a demand for increased quantities of sulphuric acid. Pyrites appeared on the market cut and polished as jewelry.

In 1901 the recovery of pyrites from coal mines in Ohio was undertaken, and considerable quantities were shipped to the acid factories.

Ten states were producing pyrites in commercial quantities in 1902. Indiana began the shipment of coal pyrites. Attention was first paid in 1903 to the utilization of by-product gases from roasting and smelting sulphide ores.

Due to lack of tariff protection, only those sources most favorably located with reference to sulphuric acid factories were able to compete with Spanish ore. It was estimated that the Virginia-Carolina Chemical Co., the American Agricultural Co., and the Standard Oil Co. together consumed 90 percent of the domestic sulphuric acid.

In 1904 fertilizer factories in Nashville, Tenn., induced the opening of pyrites deposits in Alabama. Heavy im-



portations continued. New York state passed Georgia in production, and South Dakota opened up a few deposits.

It was estimated in Virginia that mining cost $1.03 per ton, milling 47 cents per ton, general overhead 10 cents per ton, or a total of $1.60 per ton, not including concentrating, loading, transportation, taxes, amortization, or selling expense.

High Importation Totals

During the succeeding three years importation many times exceeded domestic production, and the sulphur output from Louisiana rapidly increased.

Production of sulphuric acid from the fumes of copper and zinc smelters was first reported in 1911, amounting to 438,300 tons, valued at $2,733,696. So rapidly did this process grow in favor that the following year the production increased 50 percent.

The war had little effect on the importation of Spanish pyrites, but the increased demand for sulphuric acid again stimulated production in the United States. A new use for the by-product of the damaging smelter fumes was to spray alkali soil with from 2½ to 7½ tons of sulphuric acid per acre, thus redeeming large areas of waste land.

The deposits of greatest economic value in this industry necessarily lie east of the Mississippi river, within easy transportation distance of the great chemical and fertilizer plants. The average price in 1916 was $4.64 per ton. The following year it rose to $14 per ton.

Imports increased from Canada in 1918 and decreased from Spain. The average recovery of sulphur from pyrites was 37 percent from lump and 12 percent from fines.

The sulphuric acid industry had grown to such an extent as to be considered by many a barometer of industry, analagous to the use of lubricating oil, because of the diversity of its uses.

Capacities in 1918

At the close of 1918 the capacity of the sulphuric acid plants of the country was 500,000 tons per month (on a basis of 100% H_2SO_4), or 9,600,000 tons per year (basis 50°B). The sources of supply were:

	Percent
Sulphur	52
Domestic pyrites	14
Zinc ore fumes	11
Copper ore fumes	9
Spanish pyrites	7.3
Canadian pyrites	6.7

The marked increase in production of Louisiana sulphur caused a return by many to its use. It was estimated that the United States furnished 6 percent of the world's pyrites.

Attempts to secure a tariff on pyrites were unsuccessful, on the ground that competition of sulphur and not of foreign pyrites caused the damage to domestic producers. The situation in 1919 and 1920 had settled down to a matter

A RECORD-BREAKING STOCK OF ACID PHOSPHATE

This view shows 78,000 tons of superphosphate in storage at the Baltimore plant of the Davis Chemical Company. This is the largest accumulation of this material ever brought under one roof.

of location. Wherever local pyrites deposits were adjacent to fertilizer or chemical works, they remained in operation.

The average domestic ore is 2-3 fines and 1-3 lumps. Concentration is frequently necessary. In Illinois handpicked pyrites from coal was handled in a mechanical concentrator. The average value was $5.13 per ton. In 1921 sulphuric acid to the value of $69,600,000 was manufactured in the United States. The use of sulphur continued to gain ground, and importations of pyrites fell off about 30 percent, coming principally from Spain and Canada, with scattering amounts from France, Cuba, Chile and China.

VANADIUM (AND URANIUM)

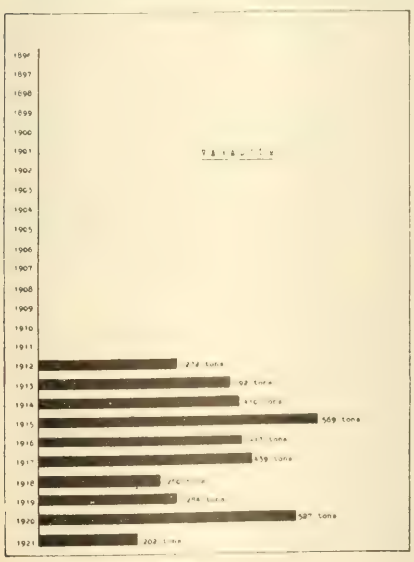
IN 1899 a demand was noted for uranium and vanadium for use in the manufacture of porcelain and glass. The oxides of uranium were used to produce a pure black glaze, and the hydrate solutions for coloring glass and in photography. The sources were Colorado, South Dakota, Montana, California and New Mexico.

Coincident with the development of the Paradox Valley in Colorado, carnotite was announced as of great economic importance, and chemical research was directed toward this field. The first uranium production was recorded in 1900 as 306,655 lbs.

Little Prospecting Done

During the next five years but little was done beside prospecting, by which deposits were discovered in Utah and North Carolina. Many exaggerated statements were made at this time as to the value of vanadium as a ferro alloy. The French experiments in its use had been failures. It was used for spars in Sir Thomas Lipton's racing yacht, and in the German Emperor's sailing yacht.

The vanadium product of 1906 remained unsold. Six thousand, eight hundred and seventy dollars' worth of uranium was produced, and all but 200 tons exported to Germany for refining, the 200 tons remaining on the dumps in Colorado and Utah, and $11,828 worth of uranium oxide and salts being imported.



Attempts to use vanadium as filament in electric light bulbs was unsuccessful, owing to its low fusing point. Announcement was first made in 1908 of the radioactive principles to be found in uranium minerals, and methods of testing radio activity were published by the United States Geological Survey. Vanadium was also used for volumetric determination of zinc.

No progress was made in 1909, due to low grade ores and smelting difficulties.

The entire production of 1910 was by two firms. Many metallurgical papers appeared on the value of vanadium in steel. The use of uranium was confined to the extraction of radium, all of which was done abroad. It was claimed that no advantages were to be gained in using uranium as an alloy, tungsten imparting the same properties and at a less cost.

Two American companies were organized in 1912 for the extraction of radium. The quantity of radium in carnotite ore was given as .000,000,234 part of the uranium present in the ore.

Radium research continued in 1913, and its value was set at $120,000 per gram.

Exemption for Radium

In 1914 Secretary Lane introduced a bill for the reservation of radium-bearing lands from entry as mining claims, in order to conserve and bring within the reach of the public the various radium salts for the treatment of disease.

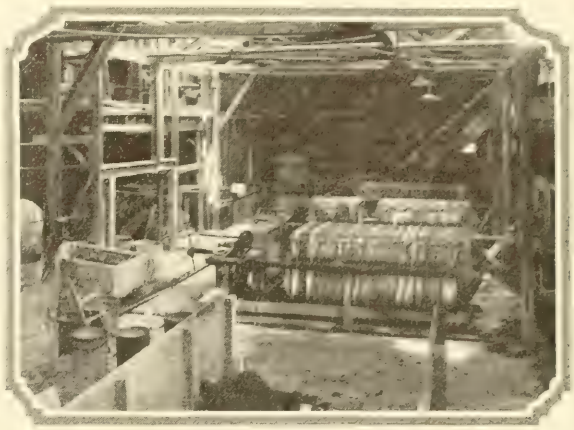
On account of the war, no ores were sent abroad for refining. The work of the National Radium Institute, in collaboration with the Bureau of Mines, caused a prediction that the price of radium would be reduced two-thirds.

Although in 1915 it was known that the United States had the largest known radium-bearing deposits in the world, most of the radium was to be found in European hospitals.

The Radium Institute mined about 1,000 tons of ore, obtaining 70 tons of concentrates and crystallized radium salts containing 6 grams of the element. Of this quantity, 3 grams were sold at a production cost of $37,599 per gram, thus justifying the work of the Bureau of Mines.

Vanadium (And Uranium)

It was determined that radium will never be found in large masses, because it is formed by the decay of uranium, a slow process, while radium itself decays and changes to other elements too rapidly to accumulate naturally in visible masses.



AN INTERESTING OPERATION

This view shows the filter presses which are used by the Radium Company of Colorado in its treatment of carnotite ore by which the separation of vanadium is effected

The 1916 output was 20,300 tons, containing 10 grams of radium, 33.7 tons of uranium and 417 tons of vanadium, valued at approximately $500,000.

The use of radium for illumination of watch faces, gun sights, and airplane dials became commercial, and experiments were conducted with mesothorium for the same purpose. The life of mesothorium was estimated at 5½ years and of radium as 2,000 years. Mesothorium being obtained from monazite, its use was recommended for commercial arts, in order that radium might be conserved for medical science.

Six Producing Companies

In all, 11.96 grams of radium were isolated in 1917. Six companies were engaged in its production. Vanadium grew to extensive use in the ferro-alloys. It was used in the construction of automobiles, gun carriages, airplanes, torpedoes, army tanks, tractors, locomotives, roller bearings, glass blow-pipe heads, tools, typewriters, machine guns, sewing machines, and an almost unlimited variety of uses where toughness and ductility are required.

In 1918 a new type of uranium ore, known as uranophane, was opened up at Lusk, Wyo., in the dump of an old silver mine.

There were a number of changes in ownership of companies, and several consolidations in 1919. Improved methods of extraction of radium were developed. Forty percent of the world's radium came from Colorado and Utah.

The approximate value of the gross output of 1920 was $2,401,000. Thirty-two and five-tenths grams of radium were isolated. The price of vanadium having risen on account of the increasing demand for vanadium steel in the automobile industry, many ores low in uranium but high in vanadium were shipped from Colorado and Utah.

Tobernite, a hydrous copper uranium phosphate, was discovered in New Mexico on an abandoned gold claim. The industrial depression of 1921 reduced the output of vanadium to 202 tons. The radium amounted to 35.693 grams.

Used as an Alloy

The joint development of vanadium and uranium has resolved into the use of vanadium as an alloy and the isolation of radium; all other by-product utilities become subordinate. The work done by the U. S. Bureau of Mines to reduce the cost and increase the quantity of radium isolated per unit of ore is a scientific achievement of which any nation might well be proud. The diversity of uses to which ferrovanadium has been adapted has placed American steel products permanently in the lead.

SUMMARY

A BRIEF résumé may now be of interest. The rise and fall of basic industries employing thousands of men, and involving the housing and feeding of these men and their families, together with the transportation of the raw product, its refinement, treatment or manufacture into commercial form of industrial use or export, and the effect of this industrial wealth upon the economic health of the nation, is a problem so intricate and so far-reaching as to demand the most serious consideration by the leaders of all industry and by all branches of legislative authority.

The Boon of Cheap Power

The part played by the development of our natural resources, our gas and coal supply, our hydroelectric power, are clearly shown in the case of zinc smelting in the one, and the aluminum industry in the other. Centers of production always follow cheap power, and transportation facilities grow toward sources of traffic.

Certain industries, such as magnesite and chromite, may remain sectional because of localized deposits. Pyrites, in view of the development of American sulphur, will continue to depend upon local markets and cheap transportation.

Anthracite coal, because of the limited reserves and increased cost of removal, must necessarily become an increasing luxury. Both anthracite and bituminous coal, however, are the victims of labor instability and greed, as the result of which the consuming public is the direct sufferer. An improvement in industrial relations, by which differences may be settled without prolonged strikes is inevitable. The pronouncement of the American Mining Congress that

> "THE RIGHT TO STRIKE IS A QUALIFIED RIGHT, WHICH CEASES AND BECOMES A CONSPIRACY AGAINST THE GOVERNMENT WHEN IT INTERFERES WITH THE PRODUCTION AND DISTRIBUTION OF THE NECESSARIES OF LIFE"

has been recognized as the foundation for constructive legislation.

Chemical research, refinement of method, electrical development and mechanical invention are all making frequent contributions to the problems of handling low-grade ores in huge quantities, and the more complete extraction of their mineral content. Copper, silver, vanadium, gold and iron are striking examples.

Leads in Spectacular Growth

In standpoint of spectacular growth, the extraction of gasoline in the petroleum industry easily takes first rank. It has been recently stated that of approximately ten million motor vehicles in the world, 85 percent are found in the United States. The increased use of tractors and pumps actuated by internal combustion engines is adding to the consumption, which may well lead to developments in the use of denatured alcohol and other fuels.

Sulphur is a striking illustration of an infant industry grown to adult state and meeting world competition as the combined result of intensive scientific experiment and felicitous location of deposits.

Molybdenum is dependent largely upon the prosperity of the steel industry, with sufficient tariff protection to enable it to compete with foreign labor.

Nickel has always been an export industry, resting upon the importation of Canadian matte for the bulk of its production. There remain, however, a group of industries, notably graphite, lead, zinc, manganese, tungsten and potash, whose prosperity is wholly dependent upon adequate tariff protection.

As in the case of graphite, there is no longer any question about the quantity of our deposits, their availability or their quality. Nor should a mere political affiliation control the life or death of great industries. Constructive statesmanship is based upon economic laws rather than upon partisan policies.

These industries have the raw materials, the machinery, the labor, and the necessary markets. Foreign competing products, due to cheap labor and in many cases subsidies, can be marketed in this country below the cost of production here. A properly allocated protective tariff would balance these differences, and no more, thus preventing monopolies, providing revenue for the government, and creating prosperity in time of peace with preparedness for time of war. In the case of infant industries, this protection might very properly be adjusted from time to time as the industry demonstrated its ability to meet foreign competition.

A Frequent Argument

It has been frequently argued that only by permitting the unlimited entry of foreign goods for a considerable period can trade balances be so adjusted as to stabilize foreign exchange and permit the settlement of war debts. To do this, however, would mean industrial stagnation at home, long continued unemployment of American workingmen, increasing gravity of industrial crises, depreciation of idle plants, mines and equipment, and industrial revolution approaching that already seen abroad.

It would appear, therefore, that such a remedy would be worse than the disease itself. Thus, while the gravity of the situation cannot be denied, the proper solution must be found in a scientific adjustment of the tariff. To this great work, as well as to all the vital problems of the mining industry-at-large, the American Mining Congress has been devoted during the twenty-five year period under observation, and will continue to devote itself in the unselfish presentation of Right and Justice, for Industrial Peace and the Welfare of the Mining Industry.

Author's note: The publications of the U. S. Geological Survey have been freely referred to and quoted in the preparation of this article. The following Bibliography will be of interest:

American Metal Market: Metal Statistics, 1912-1921
American Mining Congress Journal
American Petroleum Institute Bulletins
American Paint Journal
Black Diamond
Bureau of Foreign and Domestic Commerce: Statistical Abstracts, 1908-1921
Bureau of Mines and Geology of Idaho: Bulletins
Coal Age
Coal Trade Journal
Colorado School of Mines: Bulletins
Commerce Department (Bureau of Census) Reports
Engineering and Mining Journal
Engineering and Mining Journal-Press
Interior Department (Geological Survey) Annual Reports, 1896-1921; Contributions to Economic Geology; Mineral Resources of the United States, 1896-1921; Monographs; Weekly Bulletins.
Bureau of Mines Bulletins, Investigations and Reports
Iron Age
Iron Trade Review
Journal of Industrial and Engineering Chemistry
Manufacturers' Record
Mining & Scientific Press
Northwest Mining Truth
Roush, G. A.: Mineral Resources, 1919-1920
Saward's Annual
Tariff Commission: Information for the Ways and Means Committees of the House of Representatives, 1919
Tariff Hearings Before the Ways and Means Committee of the House of Representatives in the 66th and 67th Congresses; Before the Senate Finance Committee in the 66th and 67th Congresses
Thomson, Dr. Francis A.: The Growth of Flotation.

HUNTING NEWS IN THE WILDS OF WASHINGTON

Just one burst of zip after another—that's the trend in these hectic days when hosts of knees are bent before the altar of the god of High Gear.

A shooting star brought to earth would find itself hauled into court for not keeping to the right of the road with the rest of the slow-moving traffic.

Affairs that hop around in this atmosphere are immensely complicated, and folks generally show an increased craving for information as to what's going by. In a breath, the awry days following the war have stimulated the dear public's gullet to an appetite for news.

Washington is a great place for news, and thereby is attached the tale.

I'LL VENTURE that you never saw a new all by itself. What's more, you never heard anybody talk about a single new. Lots of times you read about news that somebody has bumped into right in your neighborhood, but I'll be gum-swizzled if there ever was mention made of just one new.

It's not hard, though, to find flocks of news. This fact, coupled with the great public demand, has made the hunting of news a regular profession.

People's tastes for news vary as greatly as their political opinions, and it is fortunate that there are enough different kinds of news flying around to insure that each individual who has formed an appetite for news will be able to get just the sort that his peculiar palate desires.

Lately I've noticed that folks have been developing an appetite for yellow news, for which there is a greater demand than ever before. Yellow news shriek and yell and sometimes folks are fooled into thinking that they are good mental food, but for the most part they are little more than bones and sometimes leave a very disgusting taste. There's a chance at all times, however, to get a flock of wholesome news, which can grace any family table if prepared correctly. The good solid stuff that the average hard-working business man demands, however, is not found in either yellow or wholesome news so much as in industrial news. The white meat of market figures and reports of general business conditions always is epecially in demand.

Then there's the trade news, carrying the same general plumage of industrial news but being distinctly marked in several ways and thus forming a number of individual families, such as railroad news, mining news, textile news and so on.

There's been a lot of interest recently in hunting mining news, of which there are two kinds, coal and metal. A lot of coal news have been in the air all summer long, having been scared out of their hiding places early in the year when the coal strike began. The depression in the metal mining districts must have starved out many metal mining news that used to hang around there, but times are getting better and more and more now are to be seen.

Washington is a fine place to look for mining news. Of course, there's a lot of them in the west, perched around on tops of mills and concentrating plants and tipples and things like that, but lots of the mining news out there are old. The news around the banks of the Potomac nearly all are young and well-flavored.

Capitol Hill is a great place to find all sorts of news, and there the mining news gather in large quantities, being especially fond of fluttering around the offices of Senators and Representatives from western states.

As always, there's going to be a lot of mining news hanging around the Interior Department building this coming winter. This kind of news seems to like to be around mining engineers and geological experts and that kind of people and wherever you find fellows who know anything about mining you are pretty apt to find some mining news circling around over their heads.

And just a little bit north of the Interior Department building there's a house where Mr. Hoover and some of the fellows who work with him have their offices. There's one particular kind of news you find around that place that are often considered quite a delicacy among mining men. It's the news that fly over here from foreign countries. News of this sort are especially thick up around the Bureau of Foreign and Domestic Commerce.

A mysterious sort of news that hang around the Department of Justice: the curious news that fly over the Federal Trade Commission's place down in Foggy Bottoms near the Lincoln Memorial; the news that often may be found over at the Department of Labor, and so on.

There's this about it, though; no matter how successful a news-hunter may be, he's got to take all sorts of care of his game or else he is likely to have a lot of spoiled news on his hands.

There are several ways of crating news for shipment, and various times at which batches of news are sent out from

IRA L. SMITH

Washington to consumers throughout the country. The very young news, of course, must be shipped immediately, being so tender that they are apt to spoil. There are several processes, however, by which they may be treated in weekly or monthly magazines so that they not only will keep well but will please the readers' palates far better than the unprepared batches of news that are shipped out by telegraph in all sorts of haste.

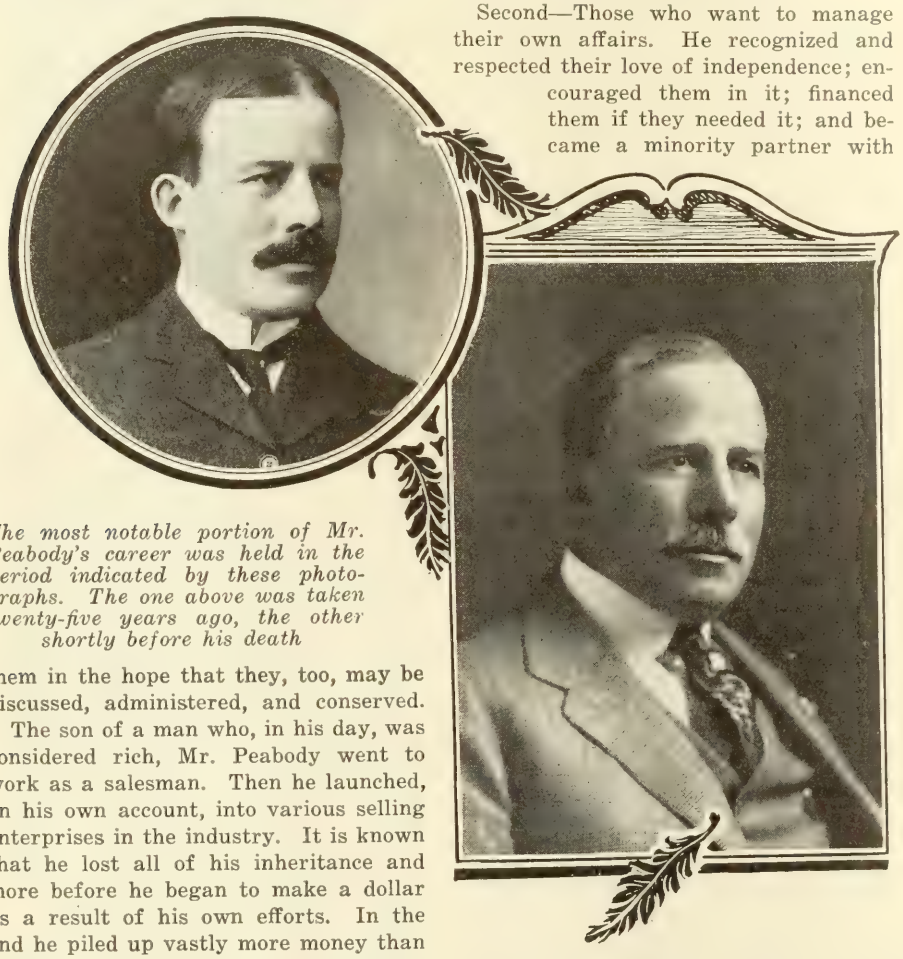
A lot of folks like their news all done up tasty in the sauce of experience and with salted viewpoints scattered over them. It takes quite a bit of time to fix news up like this, and you don't find them prepared in this style often outside of those that are shipped out in weekly or monthly magazines. But the beauty of fixing them this way is that they will keep a long while without becoming stale.

The nourishing value of news as a mental edible is being appreciated to an increasing degree, and some authorities even have gone so far as to state that a mind could grow and develop a strong physique even though its diet were restricted to news. Directors of industrial operations are making greater demands than ever before for news adapted to their particular tastes realizing that by assimilating well prepared news they will gain a valuable strength for use in directing policies of their operations. Although they have long been regular consumers of technical news, they now are realizing that their diets must be varied and benefited by the addition of Washington news to which a distinct succulency and flavor is imparted by the environs and activities of the capital.

MR. PEABODY'S BEQUEST TO COAL

By George H. Cushing

WHEN FRANCIS S. PEABODY died he left two bequests. One was a certain accumulation of money to his family. The other was an accumulation of ideas ripened by broad experience, to the coal industry in which he had labored for more than thirty-five years. His financial bequests will be measured, discussed, administered, and conserved. His mental bequests are of far greater value. It is the present purpose to attempt an hurried inventory of



The most notable portion of Mr. Peabody's career was held in the period indicated by these photographs. The one above was taken twenty-five years ago, the other shortly before his death

them in the hope that they, too, may be discussed, administered, and conserved.

The son of a man who, in his day, was considered rich, Mr. Peabody went to work as a salesman. Then he launched, on his own account, into various selling enterprises in the industry. It is known that he lost all of his inheritance and more before he began to make a dollar as a result of his own efforts. In the end he piled up vastly more money than had been bequeathed to him. Because of this experience, his conclusions about merchandising must be of great value. His philosophy of salesmanship was thus expressed once:

"A man may be a scoundrel but it does you no good to remind him of it. It merely builds a fence between you two and prevents a trade. It is wiser to hold your tongue; to leave the channel open; and, then, to guard yourself against his known peculiarities."

On another occasion he said:

"Sentiment is a beautiful thing—in your social relations. It adds charm and meaning to the domestic side of life. But, it is out of place among your office fixtures."

His general business philosophy was:

"Whatever is fit will survive. It is a waste of money and of effort to try to keep the unfit alive."

Being peculiarly a financier in coal, he built every program on men. He divided the usable men into two classes:

First—Those who want to work but want somebody to look after the money. He hired such men, paid them well and, having used them, pensioned their widows if they died in his service.

Second—Those who want to manage their own affairs. He recognized and respected their love of independence; encouraged them in it; financed them if they needed it; and became a minority partner with them. By dominating, in this way, two important groups of men and by having both of them working according to one program, he never had any real fear of the unintelligent competition of those who tried to blunder through a business venture. Toward the end of his life he said:

"I have seen all sorts of schemes tried in the coal industry. I have seen so many fail because of obvious defects that I have come to believe in one only. I believe that the men who control the money with which the coal business is done have an obligation to see that it is used wisely. My opinion is that it is used wisely only when it encourages those who, today, are doing the work of the industry in the best known way."

He followed his own advice in two ways. He had found that there were far too many retail coal yards. At one time in the city of Chicago more than 60 percent of those who had private sidings did an annual business of not to exceed 7,500 tons each. He knew that this meant inevitable waste. The individual yards, in those peculiar locations, might be necessary, but with no arrangement for the exchange of equipment; with no diversity of business to keep that equipment constantly employed; and with a separate overhead for each yard, the cost to the consumer would be prohibitive. When he organized the Consumers Company he kept the yards—the locations—but he consolidated them under one management; pooled the equipment; and added a diversity of enterprise.

He was always most willing to admit that even this scheme was not ideal. He conceded that it might and would in the future need amendment. But, for the minute, it was the most intelligent way to handle the retail coal business. Therefore, he first organized the Consumers Company in Chicago along these lines. Then later he built a super organization in New York to encourage the same sort of thing in any city which had a similar problem.

In this way he was consistent with his financial policy. Also, in building this organization, he was consistent with his personal theory. He bought some yards outright and put their managers to work for him. In other cases, he bought interest in the yards; lent them his organization, and thus amalgamated them with his own general plan.

Proved a True Financier

In the matter of owning and operating mines, he proved himself to be enough of a true financier to match his program to the exact need. That is, he did not consolidate the mines. To have done that would have paid many operators perfectly good money for bad mines only to acquire next to worthless properties while those whom he bought out would be free to build good mines with his good money. Instead, he recognized that too many coal mines already exist. Therefore, he undertook to give the best of the mines the best of his unit management and to leave the worthless mines to struggle through a precarious existence against the competition of the most intelligent sort. To this end, he built the best organization of mine manager which could be devised; loaned that

organization to struggling but good mines; and helped to finance this intelligent effort through the vicissitudes of a coal-mining experience.

There is an inheritance from Mr. Peabody also as to the proper relationship between coal and the government. In a committee meeting once he told Senator Frelinghuysen:

"You can't draw a law which will meet the coal situation."

The Senator bristled, thinking that this challenged his personal ability to steer a law through the Senate. Mr. Peabody calmly cut the ground from under him by this statement:

"I do not doubt your ability to write and to pass a law. You gentlemen in Congress can do about anything you please in that respect. But, when you have done what you now have in mind, you will find that it does not relieve but only complicates the situation. That is my point."

He was not one of those who rebuffed any advance of government towards coal. But he did say always that government proposals must be well considered before being adopted. He believed that any plan hastily devised was most likely to result in new mischief which was worse than the old. He had a way of saying:

"A mine manager once came back to advise me to buy a property. He had only been gone a week. I did not consider his advice or further services valuable. If I take that much pains over a single mine and an outlay of $250,000, how much more careful should Congress be when dealing with an entire industry."

Expressed Advanced Thought

His own venture in government established the furtherest point to which he believed the government ought to go in handling coal. He himself had advanced at the time so far toward the leadership of the coal industry that it was generally recognized that he expressed the most advanced thought in coal. Mr. Franklin K. Lane, then Secretary of the Interior, had been through the Interstate Commerce Commission and had come to express the most advanced thought on governmental regulation of industry. Mr. Peabody and Mr. Lane pooled their experiences and tried to handle the coal question during the war. Their ideas was to expedite production, and, having satisfied demands, to let prices take care of themselves. Mr. Peabody knew the capabilities of the mines. Mr. Lane knew the capabilities of the carriers. Both had faith that, if left alone, they could satisfy the nation's demand for coal by each contributing his special knowledge to the Committee on Coal Production of the Council of National Defense.

This committee, which was broken up by political interference, was on the way to establish a new theory in government and a new program for the handling of essential war materials. If it had been left alone, it would have established the theory that the surest way to influence prices downward is to get an abundance of the thing to market. That theory would have saved this country from four years of coal shortage; from four years of high coal prices; and from an unending political experiment in the matter of coal control.

ECHOES THAT ARE TWENTY-FIVE YEARS OLD

The following are items brought forth to light from pages of newspapers published in mining states during 1897 and 1898:

ARIZONA

ARIZONA is reported as rapidly coming to the front as a great copper producing region. With the completion of the Gila, Globe and Northern road to Globe, the fourth great copper camp of the territory will be opened and operated. Those already in operation—Bisbee, Clifton and the United Verde—are said to be immense producers, though none is being worked to its full capacity.

CALIFORNIA

The Randsburg district in the south continues to attract miners and prospectors, and rich strikes have been reported at other points, notably in Trinity County. A nugget was found in the Blue Jay pocket in that country worth about $42,000. This is the most valuable one ever found in the state, with the possible exception of one found in Calaveras County.

ALABAMA

The most important discovery made in the Birmingham district since it was ascertained some years ago that Alabama coal could be coked, came to light at Leeds, where a rich vein of high-grade brown ore was found.

The first run steel by the open hearth basic process was made at the new 60-ton steel mill of the Birmingham rolling mill company.

COLORADO

Recent introduction of processes for treating low-grade ore promises greatly to increase the output of the state.

Colorado took the lead among the states in gold production in 1897. New mining camps are springing up in many parts of the state. That at Eldora, Boulder County, is the opening up, practically, of the sulphide belt from Gilpin County. The town is only a few months old, but its population is 5,000, and it has several fine producing mines.

Extensive veins of anthracite coal have been discovered about 90 miles from Denver on the proposed extension of the Colorado and Northwestern Railroad.

KANSAS

An agreement between the executive committee of the miners of the Pittsburgh district and the coal operators was made August 6. It was agreed that the miners could select any grade of powder they desired, and it would be furnished them at $2 a keg. The operators also promised semi-monthly payments, which was the strongest demand made by the miners.

MINNESOTA

The discovery of a wonderfully rich deposit of iron ore on the Mesabi range, about 10 miles from Biwabik, was reported in September.

MONTANA

Everything in the operation and development of the year 1898 in Montana points to a material increase in the production of at least three staple products of Montana mines—copper, gold and silver. A large number of claims and partially developed mines in the best copper district in Butte have been purchased, and smelters and refining plants to cost over $1,000,000 are in process of construction at Anaconda.

NEVADA

With the rest, Nevada is on the upgrade. One gold mine, the De Lamar, last year gave up 90,000 tons of ore which yielded $2,000,000.

Eastern capitalists have bonded the immense copper mines a short distance from Yerrington, 50 miles from Carson, and are to build a mill and smelters at once. The opening up of the copper industry in Nevada promises to extend further. A new process for reducing ore tailings, by which it is possible to work up to 98 percent of the assay value of ore tailings of any grade, is in use near Dayton.

Preparations have been made for raising the water by pumping from the flooded levels of the Comstock mines to the height of the Sutro Tunnel, which has been put into condition to carry it off. With the resumption of deep mining the draining of old workings and development of new, it is expected that the Comstock mines will at least regain their old prosperity.

Golconda, Humboldt County, has now six hotels and several business houses, and many neat cottage residences. The hot springs at Golconda are becoming noted, and a hotel has been erected there.

OIL SHALE IN RUSSIA

By Victor C. Alderson

THE NATURAL RESULTS of the war, added to domestic difficulties in Russia, have caused the country to give close attention to its domestic supply of fuel. The Russian Fuel Shale Bureau was organized to study, to develop, and to bring to a commercial basis bodies of oil shale known to exist within the country. The work of the bureau has been hampered by a lack of trained technical men, poor railroad facilities, inefficient labor, depreciated currency, and a host of minor obstacles. Hence, the results are not to be compared with the results obtained in countries where more normal conditions prevail. However, a brief survey of the shale potentialities of Russia may not be out of place.

Oil shale, in deposits of commercial value, are known to exist at five localities:

a. At Obschtij-Sayrt, in the district of Busuluk.

b. At Pugatschew, government of Samara.

c. At Kortschew and Ostaschkow, in the Volga district, government of Twer.

d. At Undori and Kaschpur, in the Volga district, government of Ssimbirsk.

e. At Weimarn, on the Baltic railroad, near Petrograd.

The deposit at Ostaschkow is nearly horizontal with an overburden of less than three feet, so that it can be cheaply mined by steam shovels. It is dark grey in color, lies less than a mile from river transportation, and has a thickness of ten feet.

Official analyses gave:

Volatile matter	34.60 to 38.00%
Ash	50.30 to 50.40%
Tar	8.00 to 11.00%

At Ostaschkow the Russian Fuel Shale Bureau has established its experimental plant, with laboratories and experimental retorts. These retorts are of cast iron, six in number, and contain two tons of shale each.

Near Weimarn the shale is mined from surface workings and is shipped to Petrograd and Kronstadt, where it is used as raw fuel in the gas works and other industrial plants.

In the Volga district the main deposits that are now being worked are at Undori, in the state-owned deposits of the Stephen basin and near Kaschpur. In 1920 a thousand men were employed. The thickness of the workable shales averages twenty feet, the specific gravity from 1.30 to 1.40, and the estimated available amount 639 million metric tons.

Tests of the Kaschpur oil shale at the Ostaschkow experimental plant of the Russian Fuel Shale Bureau gave an average yield of tar of 10 percent of the dry weight of the shale. It was noted that with the increase of temperature there was an increase of gas produced and a decrease of tar. Slow distillation gave a high yield of tar and a low yield of gas. Complete distillation gave, up to 150 degrees centigrade, 6.78 percent of products. Ichthyol was also obtained.

OIL SHALE NOTES

The Washington Shale Oil and Products Company is erecting a retort of the Ginet type at Debeque, Colorado.

The acreage of oil shale land, in Colorado, held by the Union Oil Company of California, approximates 20,000 acres. The company has expended a million dollars in acquiring land, doing assessment work, and taking the land to patent.

The Catlin Oil Shale Products Company, at Elko, Nevada, has dismantled its old retort and erected a new one to obviate the defects in the former. Reports indicate that the retort now in use is working satisfactorily, is running steadily and producing in commercial quantities, a good grade of shale oil. The products find a satisfactory local market.

Work is being resumed by the Western Shale Oil Company on the Galloupe retort at Dragon, Utah.

The Day Engineering Company of San Francisco is erecting a retort of their own design at Santa Maria, Cal.

The Geological Department of the Southern Pacific Company has begun a field examination of the lands of the company with special reference to the occurrence of oil shale. Preliminary field tests will be made and checked by laboratory tests at the Experimental Plant of the Colorado School of Mines. The Southern Pacific Company is a large user of fuel oil so that a dependable supply of oil from its own lands would be highly desirable.

The Slangapies Coal & Oil Shale Corporation—an English company capitalized at $150,000—has been organized at Natal, South Africa, to explore and develop 40,000 acres of promising oil shale land. The tract has been opened in several places, sufficient to warrant expectations that the entire tract will prove to be valuable oil shale land. It is adjacent to the oil shale holdings of the Royal Dutch Oil Corporation which already show promising results. The prospectus of the company says: "The need in the near future of further large reserves of oil is recognized by all those engaged in this business and the growing demand for oil and the products of oil already reaching the sum of nearly four million pounds sterling per annum imported into the Union of South Africa ensures a market, apart from an export trade which will undoubtedly follow."

OIL SHALE BIBLIOGRAPHY

Victor C. Alderson

Alderson, Victor C.—Oil Shale Current Bibliography, Mining Congress Journal, August, 1922, p. 851.

Cross, Roy—Distillation Products of Oil Shale, Kansas City Testing Laboratory Bulletin No. 16, pp. 349-356.

Crouse, C. A.—Oil Shales of Kentucky, Chemical Age, August, 1922, pp. 353-354.

Day, David Eliot and Heller, A. H.—Oil Shale, Mining Methods, Handbook of the Petroleum Industry, edited by David T. Day. John Wiley & Sons, New York, pp. 854-891.

Developing the Norfolk Oil Shale Field, Petroleum Times, London, July 20, 1922, p. 157.

Eaton, Rea L.—Development of Oil Shale Claims, Shale Review, July-August, 1922, pp. 7-8.

English Oilfields, Ltd., Interim Report, Petroleum Times, London, July 29, 1922, p. 162.

Elko Shale Plant Operating, Salt Lake Mining Review, August 15, 1922, p. 21.

(The) Fusion Patent Shale Retort, Petroleum Times, London, July 8, 1922, p. 70.

Government Seeks to Quiet Title to Shale Claims, Shale Review, July-August, 1922, pp. 7-8.

Knowles, Ralph R.—Claims for Precious Metal Values in Shale Confirmed by Report of Consulting Engineer, Shale Review, July-August, 1922, pp. 3-6.

McRae, Hector—Factors Influencing Value of Oil Shale Lands, Eng. and Min. Journal Press, August 19, 1922, pp. 314-315.

Oil Supply Limited, Mountain States Mineral Age, July, 1922, pp. 22-27.

Russell, William C.—Has Oil Shale Arrived? Mining Congress Journal, August, 1922, pp. 850-851.

Starr, Charles C.—Oil Shales from a Mining Viewpoint, Petroleum Times, London, July 8, 1922, p. 58.

Thomas, Kirby—Observation On Oil Shale Treatment Processes, Chemical Age, August, 1922, p. 344.

Turner, Charles—The Charles Turner Retort, Petroleum Times, London, July 8, 1922, p. 58.

White, David—Oil Supply Limited, Mountain States Mineral Age, July, 1922, pp. 22-27.

Railroad Red Book, August, 1922, pp. 779-787.

Winchester, Dean E.—Factors Influencing the Value of Oil Shale Lands,

THE RELATIONSHIP BETWEEN LAWS AND MINING

By J. W. Thompson
Law Examiner, U. S. Bureau of Mines

THE MINING INDUSTRY, in company with all other branches of business activity, has been drawn steadily into the maze of legislation which has grown up during the past twenty-five years to thrust the government into intimate contact with industrial operations. While some of the laws affecting the industry have been direct compliances with absolute needs, many others have embodied little else than artificial efforts to remedy transient ills which would have been cured in due process of time had the natural laws been permitted to exercise untrammelled control.

Much Beneficial Legislation

Passing over the legislative errors that are revealed under the light of retrospection, laws to the great benefit of the industry provide a redeeming contrast. Foremost among measures of this beneficial type are the acts creating the Bureau of Mines and the provision incorporating recognition of the principle of wasting assets in connection with federal taxation.

The enactment of the anti-trust and federal trade laws marked the advent of the tendency on the part of the government to concern itself with matters industrial. Since these acts were placed in force prices have never been at ease. Even when holding comparatively normal levels they have always reflected anxiety of the industrial world, created by constant knowledge that the government, having taken the first drastic legislative steps, might go still further, or that interpretations of existing laws might suddenly place unforecasted conditions before the nation's business.

The coal mining industry especially has been affected by the operation of the anti-trust laws, under which the agencies of production and distribution have been divorced, regardless of public interest, thus making economical delivery to the consumer impossible. The act was passed by Congress and approved May 16, 1910, to be effective July 1, 1910. (36 Stat., 370.) This enabling act was the result of long agitation and continued efforts on the part of miners and metallurgists interested in metal mining and the study and treatment of metallic ores. The first bill to create a department of mines had been introduced in Congress as early as 1865, and for many years bills of like intent were proposed from time to time. The exhibits of minerals and mineral products at the various national and international expositions from 1893 to 1907 stimulated public interest and started anew the discussion for a department or bureau of mines.

The American Mining Congress, at its first session in 1897, and at its second session in 1898, adopted resolutions favoring such a department or bureau.

In his message to Congress, December 7, 1907, President Roosevelt recommended the establishment of a Bureau of Mines in the Department of the Interior.

In December, 1907, three coal mine explosions, two in Pennsylvania and one in West Virginia, costing the lives of 634 miners, compelled the public to give heed to the necessity for better safeguarding the lives of miners, and served to crystallize the sentiment for a bureau of mines with such object in view. This sentiment increased until the act of May 16, 1910, was passed.

Organic Act Amended

The organic act did not appear to embrace sufficiently the intended and desired activities of the bureau. Accordingly, Dr. Holmes, the first director, prepared and caused the enactment of an amended organic act, February 25, 1913. (37 Stat., 681.)

By this amended act the bureau was authorized to conduct inquiries and scientific and technologic investigations concerning mining, and the preparation, treatment, and utilization of mineral substances, with a view to improving health conditions, and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries.

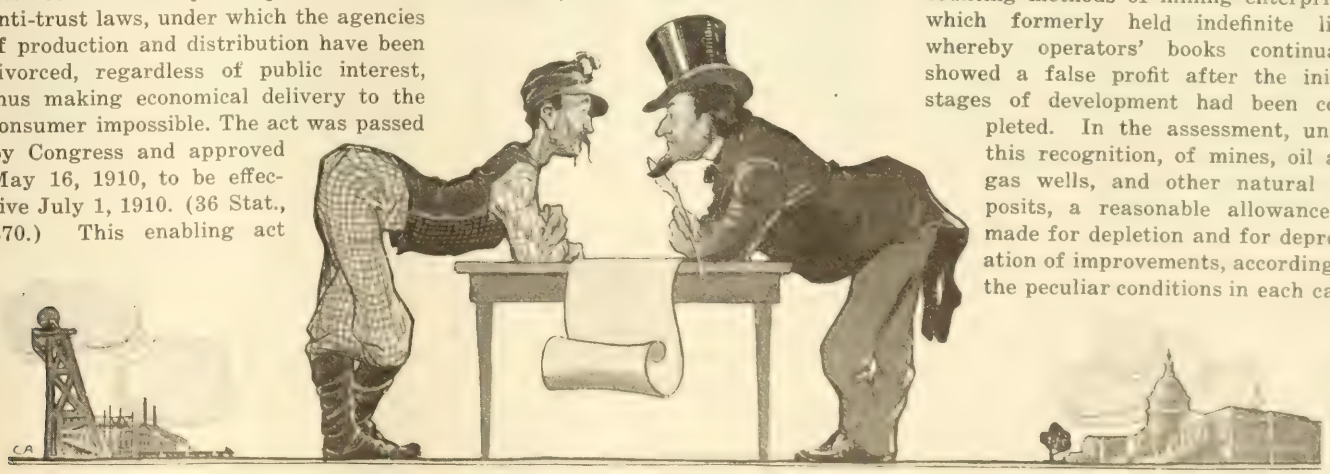
The measure required the director to report from time to time concerning the nature, causes, and prevention of accidents, and the improvement of conditions, methods and equipment, with special reference to health, safety, and prevention of waste.

Under the various acts, the bureau had been authorized to acquire ground in the city of Pittsburgh for a laboratory and experiment station on a large scale. By section 26 of the general public building act of March 4, 1913, an appropriation of $500,000 was made for a suitable building for such a station. The building has been completed and the act of March 3, 1915, appropriated $57,300 for dismantling and removing the old and the installation and complete equipment of the new plant.

The Secretary of the Interior was, by an act of March 3, 1915, authorized and directed to establish and maintain in the several important mining regions of the United States, including Alaska, ten mine equipment stations, and seven mine safety stations, in addition to those already established.

Depletion Principle Recognized

The fact that the apparent income from a mining operation is part profit and part return of capital was not recognized in any statute until the revenue act of 1913. The principle of depletion, which recognizes the wasting character of natural resources, was written into that law. This revolutionized the accounting methods of mining enterprises, which formerly held indefinite lines whereby operators' books continually showed a false profit after the initial stages of development had been completed. In the assessment, under this recognition, of mines, oil and gas wells, and other natural deposits, a reasonable allowance is made for depletion and for depreciation of improvements, according to the peculiar conditions in each case,



based upon cost of development not otherwise deducted.

If the mining property had been acquired prior to March 1, 1913, the fair market value of the taxpayer's interest on that date is taken instead of cost up to that date. But in case of mines, oil and gas wells, discovered after the above date, and not acquired as the result of purchase of a proven tract or lease, where the fair market value of the property is materially disproportionate to the cost, the depletion allowance is based upon the fair market value of the property at the date of the discovery, or within thirty days thereafter.

A peculiar and unusual provision is found in the revenue act of February 24, 1919. Section 1200 recites that every person operating a mine or quarry within the United States in which children under the age of 16 years are employed or permitted to work "shall pay for each taxable year, in addition to all other taxes imposed by law, an excise tax equivalent to 10 per centum per annum of the entire net profits received or accrued for such year from the sale or disposition of the products of such mine or quarry. . . . (40 Stat., 1057, p. 1138.)

The original mining code has been in force for a full half century and Congress has not at any time revised the mining laws as a body or system. Some patent defects existed in these mining statutes as originally enacted, but the statute wisely provided that the metal mining states could supplement the Federal Mining Law in such manner as the legislative bodies might deem suitable and proper. The only limitation was that a state statute should not conflict with the United States statute.

Individual Codes Adopted

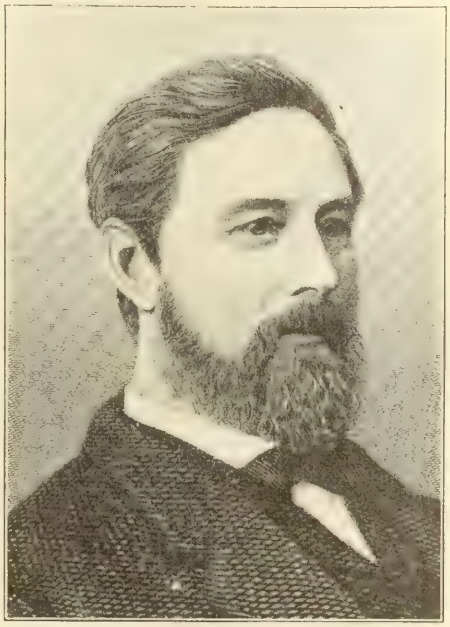
Pursuant to this authority or permission, the several metal mining states have, from time to time, adopted mining codes supplementing and improving the federal law.

By the United States statute, location and discovery originally were supposed to be simultaneous. There could be no valid location without a discovery. But all veins did not outcrop, and time was needed to make discovery. Accordingly, statutes of mining states now provide ninety days within which a locator must sink a discovery shaft of certain stated dimensions and depths.

The courts, in addition to these state statutes, have held almost universally that if a location be properly made and the locator is in possession, diligently operating to make the required discovery, he will be protected in his "possessio pedis"—the possession of his feet. One court has recently decided that the reasonable extent of the "possessio pedis" is the entire extent of the location as laid on the surface.

Another court has supplemented the ninety-day provision for making discovery by holding that if within the statutory period the locator discovers the vein and finds that his surface location does not conform to the strike of the vein as discovered, he may swing the claim and re-peg it on the surface, and if done within the time stated it will prevail over any other location that has been attempted within period given the first locator for sinking his discovery shaft.

The states, by statutes, and the courts,



FATHER OF MINING LAW

Aaron A. Sargent, who introduced the present mining law in Congress. The measure was enacted May 10, 1872

by numerous holdings, have buttressed the original mining code, and many consider it so reasonable and workable as to be doubtful if Congress can now be persuaded to undertake the difficult and tedious task of revising and enacting an entirely new mining code.

A necessity for action by Congress arose when the General Land Office, by the law officers in the Interior Department, held in 1896, that land containing petroleum did not fall within the contemplation of the mineral land laws, and could not be located, entered and patented under the placer mining laws. This holding closed all oil and gas lands on the public domain from occupation and development.

The General Land Office reversed its decision and, on November 6, 1897, held that lands chiefly valuable on account of petroleum deposits contained therein were of the character subject to entry under the placer mining laws.

The Moving Cause

It is possible that the moving cause of the change in the holding was the fact that if lands containing petroleum were not mineral lands within the meaning and terms of the United States mining statutes, then railroad companies throughout the western states could grab off such lands under their option to select indemnity and lieu lands.

However, shortly after the first holding by the Land Office a bill was introduced in Congress, and on February 11, 1897, became a law, by which all qualified persons were authorized to enter, under the mining laws of the United States, lands containing petroleum or other mineral oils, and chiefly valuable therefor, according to the provisions of the laws relating to placer-mining claims. The act also provided that any such lands that had theretofore been filed upon could be held and patented under the provisions of that act (29 Stat., 526).

Oil lands were taken with unusual avidity until 1909, when it was deemed necessary for the President to withdraw from entry certain areas of known producing oil lands. Although expressing doubt as to his power to withdraw such lands from entry, the President on September 27 withdrew large areas of lands designated as oil-bearing, from location, occupation and entry.

Congress, sharing the President's doubts, relieved the situation by the passage, June 10, 1910, of the well-known Pickett act, which provided the necessary authority. This act was amended August 24, 1912, by limitating the rights of exploration, discovery, entry and purchase under the mining laws to metalliferous minerals. (37 Stat., 497.)

The question as to the power of the President to withdraw the oil lands by Executive Order prior to the act of February 11, 1897, was contested by certain oil companies who disregarded the Presidential order and sought to exploit oil lands so withdrawn. The Supreme Court, however, held that sufficient proof existed of congressional recognition of the President's power.

Pursuant to the act of 1910, vast areas of oil lands were withdrawn from location. These withdrawals were being made, doubtless, to defeat the result of the act of February 11, 1897, authorizing oil locations under placer-mining laws.

These withdrawals were leaving many millions of oil lands upon the public domain not avaialble for development.

An Agitation Started

As early as 1907 an agitation had been started to lease the public lands containing oil, gas, coal, phosphate and sodium. From that date to 1919, leasing bills were introduced in every Congress. These bills were vigorously opposed by practically every western congressman, on the ground mainly that leasing was not believed to be the best system for the disposal of such lands. Not until after the

United States entered the World War was the necessity created for the development of the withdrawn mineral lands. Senator Smoot, the leading figure in opposing the leasing system, was one of the first to see the necessity for a change in the policy of the government respecting the public mineral lands.

On June 2, 1919, Senator Smoot introduced Senate bill 1269, to "promote the mining of coal, oil, gas, phosphate and sodium on the public domain." This bill was variously amended by the Committee on Public Lands, a new bill formulated based on leasing only, and was by order of the committee reintroduced by Senator Smoot August 15, 1919, as Senate bill 2,775.

The leasing act was amended March 4, 1921, to the effect that where prospecting work was necessary to determine the existence or workability of coal deposits in any unclaimed undeveloped area in Alaska, the Secretary of the Interior, may issue prospecting permits for a period not exceeding four years to applicants qualified under the original act, for not to exceed 2,560 acres. If within the life of the permit coal is discovered the permittee shall be entitled to a lease for all or any part of the land in his permit (41 Stat., 1,363.)

Some measures relating to oil locations were enacted from 1911 to 1914, but these became inoperative by reason of the leasing law.

By an act of August 24, 1912, entries under the homestead and the desert land law were authorized to be made on any oil lands withdrawn from entry or purchase, subject to either prior or subsequent oil rights. An act of July 17, 1914, provided that all lands withdrawn or classified as phosphate, nitrate, potash, oil, gas, or asphatic minerals, should be subject to location or entry under the non-mineral land laws; with a reservation of all such minerals in favor of the United States.

Metal Mining Legislation

During recent years statutes have been enacted making provisions for mining locations where the surface was otherwise owned or occupied. Suspension for performance of annual assessment work, and a change in the period for performing such work have aided the owners of unpatented mining claims.

Statutes dealing with gold and silver, in both bullion and coin, have affected the mining industry and for a time made it so unprofitable as to practically stop the operation of all gold mines.

In the interest of the war, Congress passed, October 5, 1918, an act to "provide further for the national security and defense by encouraging the production, conserving the supply and controlling the distribution of those ores, metals and minerals which have formerly been largely imported, or of which there is or may be an adequate supply." (40 Stat., 1,009.) This law being strictly war legislation, served its purpose and became obsolete.

On March 2, 1919, Congress enacted unprecedented legislation to "provide relief in cases of contracts connected with the prosecution of the war," under which the Secretary of the Interior was authorized to adjust, liquidate and pay net losses suffered by those who produced or prepared to produce manganese, chrome, pyrites or tungsten" in compliance with the request or demand of the Department of the Interior, or the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation to supply the urgent needs of the nation in the prosecution of the war."

THE INTERIOR DEPARTMENT BUILDING
This massive structure in the nation's capital houses those agencies of the government dealing with the public domain and it is here that laws relating to the mining industry are administered

In the administration of the act it was soon discovered that few claimants entered the race for such war minerals "in compliance with the request or demand of the agencies named." The attorney general gave an opinion to the effect that only those who produced or prepared to produce the minerals named at the request or demand of the agencies named could share in the distribution of the sum appropriated. (40 Stat., 1,272.)

Original Act Broadened

Shortly after this opinion, November 23, 1921, Congress, by an amendatory act of that date, broadened the scope of the original act and admitted all claimants to a share in the fund who, in response to any personal, written or published request, demand, solicitation or appeal from any of the government agencies. (41 Stat., ——, Public No. 99, 67th Cong.)

Claims totaling $18,131,493 had been filed with the commission prior to September 1, 1922.

The most important single item of legislation relating to mining claims proper is found in the act of August 24, 1921, changing the period for performance of assessment work from the calendar to the fiscal year.

The measure, introduced by Senator King, Utah, provided that the period within which the annual work on unpatented mining claims should commence at 12 o'clock meridian on the first day of July "succeeding the date of location of such claim." It was also provided that as to claims on which the annual period ended December 31, 1921, should continue to 12 o'clock meridian July 1, 1922.

By joint resolutions of August 15, 1919, and of November 13, 1919, the annual assessment work required to be performed on unpatented mining claims was suspended during the calendar year 1919. (41 Stat., pp. 279, 354.)

The agricultural appropriation act of March 4, 1917, authorized the Secretary of Agriculture under general regulations to permit the prospecting, development and utilization of the mineral resources of the lands acquired under the act of March 1, 1911, authorizing the acquisition of forest lands on water sheds of navigable rivers. (39 Stat., 1,134, p. 1,150.) By an act of December 16, 1916, qualified persons were authorized to make stock-raising homestead entries of not more than 640 acres of public lands, designated by the Secretary of the Interior as "stock-raising lands."

Mineral Contents Reserved

By section 9 of the act all such entries made and patents issued must contain a reservation to the United States of all coal and other minerals in lands so entered or patented. Provisions are made for prospecting and mining the minerals discovered in any such lands. (40 Stat., 862.)

Under the act of October 22, 1919, authorizing the Secretary of the Interior to grant permit to drill or explore for water on areas not exceeding 2,560 acres of the public lands in Nevada, all minerals are recorded to the United States. Permission is given to qualified persons to enter upon and locate coal or other mineral claims on any such lands. (41 Stat., 293.)

To prevent any possible injustice arising from a statute passed in 1907 under which an American woman who had married a foreigner could not obtain title to a mining claim, Congress provided on October 27, 1914, that any female citizen of the United States who complied with existing laws and conditions for acquir-

ing title to a claim should be entitled to a certificate or patent.

March 14, 1900, Congress passed an act "to define and fix the standard of value, to maintain the parity of all forms of money."

It was enacted that the dollar, consisting of 25 8-10 grains of gold, 9-10 fine, as formerly established by law, should be the standard unit of value, and all forms of money issued or coined by the United States should be maintained at a parity of value with this standard.

FRAMED MINING CODE

Benjamin Franklin Rice, Senator from Arkansas (1868-1873), who, as chairman of the Senate Committee on Mines and Mining, played a prominent part in the molding of the present federal mining code

The treasurer was authorized to receive deposits of gold coin in sums of not less than twenty dollars, and to issue gold certificates therefor in denominations of not less than twenty dollars, the coin to be held for the payment of such certificates.

Some slight amendments and modification of this act were made from time to time.

The Pittman Act

By the Pittman act of April 23, 1918, authority was given the Secretary of the Treasury from time to time to melt or break up and to sell as bullion not in excess of 350,000,000 standard silver dollars then or thereafter held by the Treasurer. The silver certificates outstanding against any such silver dollars so melted or broken up were to be retired at the face amount with sales of such bullion to be made at a minimum of $1 per ounce of silver one thousand fine and upon terms fixed by the Treasurer.

When a sale was made the Treasurer should direct the Director of the Mint to purchase in the United States of the products of mines and of reduction works, located in the United States, an equal amount of silver.

Probably the most disastrous results ever visited on gold mining were produced by the Federal Reserve Bank Act of December 23, 1913. The authors and friends of the law doubtless did not intend or suspect any evil results on the mining of gold.

Under prior acts gold mining has been profitable and prosperous. The issue of gold and silver certificates was a wise provision to prevent the actual lugging of gold and silver coin. By the law of 1900, the parity of all kinds of money had been beautifully maintained and all such certificates passed current as readily as gold and silver. All such certificates were instantly convertible into coin on demand. Each gold certificate had a full gold dollar back of it as an absolute guaranty of its full face value. Likewise the silver certificates. These certificates became more desirable than coin, and their popularity steadily grew. All money seemed to be on a solid and stable basis. Gold and silver bullion were sold for money worth a dollar, measured by the gold and silver reserves.

Section 16 of the Federal Reserve Act was the part that made havoc of gold mining. By this section the Federal Reserve Board at its discretion could issue Federal Reserve notes as obligations of the United States. "Every Federal Reserve bank shall maintain reserves in gold or lawful money of not less than 35 percentum against its deposits, and reserves in gold of not less than 40 percentum against its Federal Reserve notes in actual circulation, and not offset by gold or lawful money deposited with the Federal Reserve agent."

Immediately on the issue of these Federal Reserve notes, with a 40 percent gold basis the gold certificates were generally, almost universally, withdrawn, and the gold reserve back of each dollar of gold certificates could serve as a basis of two and one-half times the amount of Federal Reserve notes. What demand could then be for more gold bullion until the issue of Federal Reserve notes amounted to two and one-half times the total amount of the former gold reserve, and thereafter forty cents' worth of gold would answer the purpose for which formerly a full dollar's worth was required. Thereupon a gold mine operator was required to pay one dollar in "lawful money" for every forty cents' worth of gold mined. The natural result followed: Gold-mining ceased, except possibly where operators would lose more by deterioration in equipment than in operation.

UTAH CHAPTER REPORT

By A. G. MacKenzie

IN ALL EXCEPT one respect, the metal mining situation in Utah at the beginning of the 1922 fall season is greatly improved over last year. There is a pronounced shortage of skilled labor and production suffers accordingly.

The first of the year found many of the principal low-grade properties shut down on account of market conditions. Some of them resumed April 1 and others in the weeks following until by June 1 practically all the properties were again in operation, although many of them are still below their normal rate of production for one reason or another. Although prospecting and development work have not been active recently, several mines of good promise have been added to the list of shippers within the year.

The Freight Rate Situation

The general railroad reduction ordered by the Interstate Commerce Commission in May did not apply to mine products in Utah for the reason that they were already under the rates restored in the order. Rates on many classes of ore were, however, voluntarily reduced by the railroads later. In some cases rates are now lower than for several years past and this action has had a splendid effect on the situation in the state. It is believed that the statistical and other information laid before the Interstate Commerce Commission at Washington by the Utah Chapter, American Mining Congress, last January was largely responsible for the reductions made in the state.

Effect of Coal Strike

Coal mine operations suffered somewhat from the strike of April 1, although much less than the country as a whole. Operations in Utah were maintained throughout the trouble at 75 percent of normal or better. An adjustment was reached early in September. Some instances of violence in the coal fields led the governor to place the state militia on duty a few weeks after the strike commenced and the situation was practically uneventful thereafter as far as the maintenance of order was concerned.

The annual election of the Utah Chapter placed at its head one of its charter members in the person of Fred Cowans, general manager of the Utah Consolidated Mining Company. Mr. Cowans has always been an active and useful participant in the work of the chapter and has given it much personal attention since his election. His associates as vice-governors are J. William Knight, V. S. Rood and D. D. Muir, jr. A. G. Mackenzie continues as secretary and treasurer.

MOTOR TRANSPORTATION AND THE MINING INDUSTRY

By Windsor T. White*

TODAY HUNDREDS of mines are known to contain ore in quantity and grade sufficient to pay big profits if the cost of moving the ore to the smelter can be kept low enough. Some mines have been closed because of failure in this respect, while others, always producing profitably, have increased their output and lowered their overhead by installing the proper hauling shipment.

Hauling costs must be low for a low grade of ore. And the hauling equipment must be of the highest character to insure a low cost under severe operating conditions. The necessity of selecting the proper type of motor truck for the specific hauling conditions that will be encountered is very necessary. The conditions of service vary so greatly in different sections of the country that each installation requires a special study.

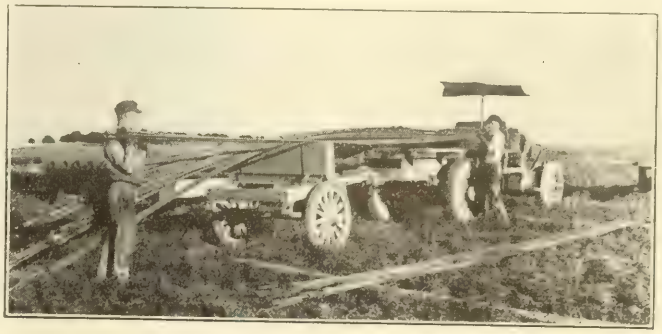
Serves to Offset Handicaps

During the past two or three years, mine haulage methods have, therefore, been undergoing a gradual change incident to the increased demands of commerce. Perhaps the most striking illustration of this evolution is seen in the introduction of the motor truck to overcome the handicaps to efficient and economic transportation caused by manual or animal labor. It is very obvious that the conveyance of such heavy articles as masses of ore deposits requires the utmost mechanical power, as it is often considerable distance from the mouth of the mine to the stamp hill, where the ore is reduced for commercial purposes by the action of chemicals.

Particularly in the mining of coal has there been a tendency of late to motorize all the processes of extraction and conveyance. There are about 4,000 coal mines in this country at the present time; approximately 2,000 of these are without railroad connections. The latter may be roughly divided into shaft and lateral tunnel mines; in both cases it is necessary, as indicated above, to haul the ore to the railroad spur for final distribution. The size of these mines vary considerably; some of them may spread over an area of one or two miles, with the veins running down in depth from six inches to six feet. In general it may said that the production of the shaft mine is much larger. The amount of coal produced by a single mine varies considerably and may run from seventy-five to two hundred tons per day.

Method of Handling Load

As a rule, most of the mines of these types are provided with adequate tipples. This simplifies the problem largely in the loading of the truck. When it comes to transferring the load into the freight car the crux of the situation is reached. However, where the smaller mines are in the neighborhood of larger ones with fully equipped railroad loading facilities the ordinary dump body can be advantageously used in connection with the elevated platform. Generally speaking, no more than one minute should be consumed in loading under these circumstances and not more than three or four minutes necessary for unloading. Where this same work has to be done by hand, as fully fifty percent of the wagon mine operators have no adequate facilities of this character, twenty to thirty minutes is taken up in the unloading process.



THE SERVANT OF INDUSTRY

Approximately seventy-five percent of the hauling in the Texas and Oklahoma oil fields is carried on by means of specially designed truck and trailer combinations

In the light of this utility and economy of the motor truck is in striking evidence. By means of a hydraulic hoist operated by the motor in the vehicle, the body is raised to an angle of about 40 degrees. The coal thus is propelled by force of gravity through apertures at the rear and the bed is emptied usually in 30 seconds. To facilitate unloading, motor trucks also are designed so that coal may slide through side or corner exits. These modes of unloading are applicable where there are manholes or other means of entrance at destination. Motor trucks are generally equipped with iron or steel chutes of various lengths, one end of which is attached to the vehicle and the other inserted at the point of ingress.

With the exception that the ore is shipped direct to the smelters and is not worked locally in its crude state, there is very little difference in the truck operating principles in vogue among the principal companies that are working the 400 iron mines in this country at the present time.

Forms Dependence of Many

In the mining of copper, lead and zinc, the methods employed are almost identical. Very often these ores are discovered in the same mines, of which there are about 2,400 at the present time. The quantity of supplies and machinery requisite to the efficient mining and milling of these ores is much greater than that necessary for extracting iron and coal deposits of equal tonnage. Approximately 75 percent of the operators are under the necessity of transporting both their products and supplies to and from their local supply stores by motor trucks, inasmuch as the tonnage shipped from any one mine is not great enough any one season of the year to make it profitable for the railroad to establish direct connection.

The Moctezuma Copper Company at Nacozari, Sonora, Mexico, for three years past has been using trucks for haulage of ore from its mines. The ore is first delivered by burros from the mine to Moctezuma, Sonora, a settlement 57 miles south of Nacozari, where it is picked up by truck.

The trip between Nacozari and Moctezuma is something of a steeplechase. The first obstacle is the roadbed itself. Every now and again, the road climbs a hill at grades as high as 20 degrees. Finally, the Nacozari River must be crossed and recrossed 11 times in the first 12 miles south from Nacozari; in places the river bed is between 200 and 300 feet wide. To traverse the sand roads and shallow water pools at these places is a real test of a truck's power. On these trips, supplies are generally carried from Nacozari to Moctezuma. The real pull comes on the return and uphill leg of the journey with a five-ton burden of ore.

Chrome ore deposits, which are ordinarily found in small pockets, are invariably located high up in the mountains. The mine operations, which are of a necessity comparatively simple, resemble more the methods used in quarrying than

*Chairman, National Motor Truck Committee, National Automobile Chamber of Commerce.

the customary gold mining operation. Generally speaking, the ore is piled high at the mouth of the mine and is periodically sledded down the steepest embankments to loading platforms, from which the trucks receive it. There are in the Siskiyou County mineral belt deposits that have produced more than the average amount of ore, which is generally not more than two or three thousand tons of high-grade ore. In the mountains of Nevada a five-ton truck recently completed a mileage record of 90,000 miles with a maintenance cost of only 2 6/10 cents per mile.

A Unique Operation

Out on the Pacific Coast a mining operator converted a motor truck into a locomotive truck for transportation of standard gage and flat cars, used in the reconstruction of the 1,400-foot tunnel at Santa Rafael for the Northwestern Pacific Railway. It was imperative that the smoke and gas nuisance, which would attend the use of an oil or coal-burning locomotive in the prosecution of this project, be eliminated; on this account a searching investigation for an adequate substitute was made. The motor truck, whose tread was about the same width as that of a standard gage railway, was found to be the most feasible solution of the problem at hand. With comparative ease this locomotive truck has hauled two 40,000 capacity standard gage dumps and two 60,000 capacity flat cars into the tunnel on a 7 percent grade at one time; this is a much more severe test than was originally planned to put the truck to.

Fast motor trucks are also helping in mine safety and first aid work. Specially designed mine-rescue trucks carry fire extinguishers, safety lanterns, hose, axes, crowbars, miners' tools, drills, saws, picks, shovels, rope, compasses, complete sets of surgical dressings and instruments. A portable telephone is usually carried into the mine to enable the members of the corps to communicate with the surface workers.

In general, the carrying capacity of the motor truck in transportation of materials from the mines ranges from 3½ to 7½ tons. Frequently, a motor unit is applied to the hauling not only of its own load, but to those of one or more trailers, with the result that the hauling capacity of the machine is increased, without undue strain or distress, to as much as thrice its designated ability. Another form of the trailer system is that in which a tractor is the motive unit, in which it draws two trailers, each with a load capacity of 7½ tons. The tractor is often equipped with a bed capable of bearing 5 to 7 tons, which increases its carrying capacity to more than 20 tons. The speed of such a combination ranges from 8 to 12 miles an hour on roads or trails, the gradient of which at times is 15 to 20 percentum. The displacement value is roughly figured at 15 teams and reduces the time to travel 18 miles or 32 miles from mine to rail or waterway; or, in the case to reduction works and return, from 48 to 10 hours.

Mainstay of Petroleum Industry

Another field of motor truck operation that perhaps presents equally great transportation difficulties and problems is in the production of petroleum products. In the rainy spells the soil in most of the oil fields becomes very clayish. During this period, which generally lasts for three or four months each year, trucking becomes intermittent, as very few roads are of the improved type. Delays encountered in this way on account of the inability of the trucks to get through with materials often entail great losses. It is apparent at once that if highways were properly built in the various fields they would pay for themselves in less than a year; but up to the present time very little attention has been paid to the possibilities in this development.

Approximately 75 percent of the hauling in the Texas and Oklahoma oil fields is carried on by means of specially designed truck and trailer combinations.

Mine operators and petroleum producers who will give time and attention to the study of fundamentals in truck operation at the mines and in the oil fields will obtain better and more permanent efficiency. The tendency has been to get the load to the shaft or derrick in the shortest possible time; the great need for supervision of the motorized equipment often is overlooked.

There is every reason to believe that there will be, from now on, a marked tendency to utilize power trucks in the transportation of mineral products from their sources on initial steps toward points of consumption. Just how extensive this movement will be may, perhaps, be gleaned from the fact that the products from approximately 3,300 mines are being conveyed by motor trucks or wagons at the present time.

AFRICAN GOLD MINES ARE PROSPERING

REPORTS FROM South Africa state that the gold mines are making good progress, there being an increase in output and a decrease in operating costs, which latter has injected a healthy confidence in the industry, as previously apprehension was entertained on account of the continued reduction in the premium on gold. In July, gold production in the Transvaal amounted to 730,635 ounces, exceeding that for any month in the preceding two years.

SULPHUR DIOXIDE LEADING STUDIES FORM SUBJECT OF REPORT

RESPONDING TO NUMEROUS requests from members of the mining industry for information regarding the status of the work on the sulphur dioxide leaching process, the Bureau of Mines has issued a bulletin, covering work on this subject conducted at the bureau's Tucson, Ariz., station.

The advantages claimed for the sulphur dioxide leaching process developed by the bureau are that the required plant is compact and inexpensive, with no particular installation difficulties and with light power requirements. The operation of the plant is simple and easily controlled; there are no delicate adjustments or critical points. Percolation difficulties common to leaching are entirely avoided. Perfect contact is assured between finest ore particles and reagent.

The reagent is very cheap and excellent utilization is attained; the process may therefore be extended to ores having a much higher acid-soluble gangue content than could be considered in ordinary sulphuric acid leaching practice. The process is applicable alike to large operations and to relatively small operations without undue increase in operating cost for the smaller installations. Copies of the bulletin may be obtained from the Bureau of Mines, Washington, D. C.

NEW PLATINUM ANALYSIS METHOD

WORK is being continued by the Bureau of Standards on the proposed new methods for the analysis of platinum ore, under which it is sought to remove the iron present in the ore without bringing the ore into solution. It is found that this can be done by first fusing the ore with zinc, disintegrating the zinc obtained with hydrochloric acid and fusing the residue with potassium pyrosulphate. If successful, this method of treating the ore will furnish a complete departure from the present practice, and the bureau believes that it will be much more accurate and at least as rapid as the methods now being used.

Tests of the resistance of chromium steels to acid corrosion have recently been completed, and a comparison of the results obtained shows that the relative resistance of a steel to the acid test is not necessarily a criterion of its behavior in other types of corrosion. Pure iron and the steels of low chromium content were found to be much more resistant to attack by hydrochloric acid than those containing considerable chromium. When corroded by water and air, the general order of resistance was reversed.

Miles Poindexter

Woofing and Warping

XI. Senator Miles Poindexter

A Series of Scrutinies Directed Toward Notable Legislative Personalities

By IRA L. SMITH

TAKE A BOOMING voice and wrap it up in a man who stands six feet above his O'Sullivan's: you then have an approximation of Miles Poindexter, the amphibious Senator who, after serving well as chairman of the Senate's Committee on Mines and Mining, soon will take to sea and steer the affairs of that august body's naval committee. He is typical of the West, savoring of the solidity of mountains and the endless capacity of plains.

Perhaps no man can have his cup of political success filled without possessing a marked degree of earnestness, or at least an intensity of effort, save only those cases where quirks of Fate have brought about the unusual. Since flukes are to Senator Poindexter's career as feathers are to a pig, it is evident that some considerable strength of purpose resides within him to have lifted him from behind a lawyer's shingle in Walla Walla into a senatorial seat at the nation's capital.

He arrived in Washington just in time to take part in the fine fracas which stripped the Speaker of the House almost as clean of authority as a hod carrier. Two years on the job as a Representative and he felt the urge to move his letter files over to the Senate side of the Capitol. An overwhelming majority in the 1910 primaries and a no less brilliant victory in the election that followed put this across.

Talking about elections, the old familiar chant "If elected, I will stand by the people, first last and all the time" is brought to mind. Whether Mr. Poindexter used this in his campaigning is not known to this scribe and is not essential. But one thing is certain, he long has stood against monopolies and profiteering. He threw his broad shouldersinto the battle against excessive profits even before the majority of the dear folks got hep to the fact that the war was going to give birth to one fine litter of gougers, and some of his proposals were swung into the well-known, far-famed and justly celebrated Lever Act. Then, too, he always has been a booster for placing a ring in the nose of any monopoly of water and rail transportation.

He is an unusual party man—being both the liberal and the conservative, but at no time the radical in either. No shifting of views; merely a merging.

Unlike many political figures, he is none the less interesting when lamped outside his main bailiwick. He scribbles for periodicals; dives into French; knows his Bible; goes fishing and hiking and corresponds at much length with his son, who is a graduate of Annapolis. Atop this, he is a bug on spelling, having recently led a bevy of Senators into the horrible fray of a spelling bee against a flock of newspaper men.

All in all, quite a man.

REVIEW OF FEDERAL LEGISLATION

By George H. Bailey

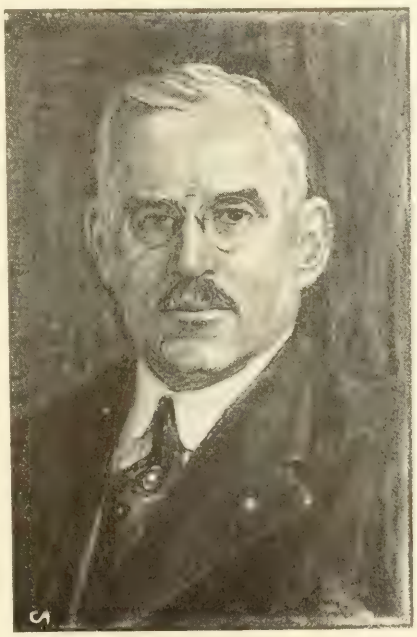
THE MINING INDUSTRY has been well justified in paying rapt attention to the activities of Congress during recent months. Hosts of bills having a direct economic effect upon the industry have been introduced and, although few have been passed, progress on several important measures reached the point where the mining industry has found it necessary to crystallize its observations into definite policies.

Had Congressional activities since last October been restricted to passage of the tariff bill, the mining industry still would have maintained much of the interest it has placed in the work of the national legislators. The future of many infant branches of the industry has been in the balance, depending upon rates of duties placed upon competing foreign importations, and the older divisions all have been affected in varying degrees by action taken upon the metal and other schedules.

Many Coal Measures

The coal-mining industry never before has found so many bills before Congress in which it is concerned. The majority of these were introduced following development of the recent industrial situation, although scattered proposals for regulation or control of the industry had been introduced prior to the time that pressure by the administration and desire to come within the ken of the public eye caused several members of both houses to introduce their "pets."

Since revenue relations with the government always vitally affect industry, it is natural that mine owners and operators should have keenly watched revision of the federal tax laws. This revision, made by Congress at the close of the special session, had the effect of reducing the total of the federal taxes imposed upon the mining industry by approximately 5 percent, it being estimated that this total was 18 percent for the taxable year immediately prior to repeal of the excess profits and other taxes which brought it down to the present level. The industry's concern in connection with the federal tax statutes is of permanent character, being increased at all times by the tendency of the individual states to impose additional levies which already offset to a large extent the reductions made in federal taxes.



GEORGE H. BAILEY
Counsel, American Mining Congress

Bills Affect Metal Mining

Of paramount interest to the metal mining industry have been the proposals for revision of the mining laws and for enactment of blue-sky legislation. The extent to which consideration of the tariff bill has clogged the congressional machinery largely is responsible for the lack of more definite action upon the blue-sky bill. In the case of the revision bill, the legislators waited many weeks in their efforts to sound the opinions held by the various branches of the industry. The Denison blue-sky bill made progress with some degree of speed through the House, but found itself halted in the Senate committee on interstate commerce, with slight possibility for action before the next session gets under way.

Of the enacted measures that have come out of the legislative mill during recent months, the Shortridge bill providing for a more liberal interpretation of the War Mineral Relief measure has had a vital effect upon those branches of the mining industry that were left "high and dry" by a sudden decrease in demand for their products at the close of the war. This measure has enabled the war minerals relief commission to reconsider many claims upon which action could not previously have been taken, making possible in addition the consideration of many claims which previously had not been construed as coming within the terms of the act.

Of Direct Benefit

Direct benefit to prospectors and those generally connected with the development of mining claims came in the enactment of the Hayden bill, which changed the period for performing assessment work from the calendar year to the fiscal year.

A summary of the important bills before Congress during the past twelve months follows:

MINING

Bill	*Introduced by*	*Purpose*	*Referred to Committee*	*Present Status*	*Final Action*
S. 843.	Shortridge (Rep.) Calif.	More liberal interpretation War Minerals Relief Act.	Mines and Mining.	.....	Enacted into law.
HR. 4813.	Hayden (Dem.) Ariz.	Changing period for annual assessment work on mining claims from calendar to fiscal year.	Mines and Mining	.....	Enacted into law.
HR. 7736.	Arentz (Rep.) Nev.	General revision; hearings held, April 1922.	Mines and Mining.	In Committee.	.....
S. 3509.	Moses (Rep.) N. H.	Eight hour day.	Labor.	In Committee.	.....
HR. 11659.	Oldfield (Dem.) Ark.	Validate placer mining patents in Red River, Okla.	Public Lands.	In Committee.	.....
S. 3684.	Nicholson (Rep.) Colo.	Validate placer mining patents in Red River, Okla.	Public Lands.	In Committee.	.....
HR. 11928.	Newton (Rep.) Minn.	Validate placer mining patents in Red River, Okla.	Public Lands.	In Committee.	.....
HR. 12233.	Sinnott (Rep.) Ore.	Validate placer mining patents in Red River, Okla.	Public Lands.	In Committee.	.....
S. 3828.	Harreld (Rep.) Okla.	Validate placer mining patents in Red River, Okla.	Public Lands.	In Committee.	.....

Bill	*Introduced by*	*Purpose*	*Referred to Committee*	*Present Status*	*Final Action*
S. 3519.	Bursum (Rep.) N. M.	Mining leases on Indian reservations.	Indian Affairs.	Passed by Senate; now in House.	....
S. 889.	Bursum (Rep.) N. M.	To assure title to lands granted states.	Public Lands.	Passed by Senate; now in House.	
HR. 11871.	Taylor (Dem.) Colo.	Protects homestead entrymen where mineral deposits are leased.	Public Lands.	In Committee.	
HR. 11887.	Colton (Rep.) Utah.	Sale of gilsonite lands.	Public Lands.	In Committee.	.....
HR. 11889.					
HJ.Res.176	Edmonds (Rep.) Pa.	Govt. approval of mine and other exhibition in Phila. in 1926.	Expositions.	.....	Enacted into law.
S. 3730.	Kendrick (Dem.) Wyo.	Mineral claims to be filed in local land offices.	Public Lands.	In Committee.	
S. 2460.	Smoot (Rep.) Utah.	Extending Section 18a of the leasing law to lands in Utah.	Public Lands.	Enacted Into Law.	.....
S. 3794.	Kendrick (Dem.) Wyo.	Quarterly payments of leasing law receipts to states.	Public Lands.	Passed by Senate; in House.	.....
S. 3747.	Smoot (Rep.) Utah.	Leases of Indian reservations for mining purposes.	Indian Affairs.	Passed by Senate; in House.	.....
HR. 8344.	Sinnott (Rep.) Ore.	Extension of time under oil and gas permits.	Public Lands.	.....	Enacted into law.
S. 3456.	Kendrick (Dem.) Wyo.	Royalty payment to Wyoming for oil produced in Teapot Dome.	Public Lands.	In Committee.	.....
HR. 11363.	Mondell (Rep.) Wyo.	Royalties to be paid to states in which naval reserves are located.	Public Lands.	In House.	.....
HR. 11580.	Snyder (Rep.) N. Y.	Leasing unallotted Indian lands.	Indian Affairs.	In House.	.....
HR. 10102.	Dennison (Rep.) Ill.	Protecting State Blue Sky Laws; hearings held January, 1922.	Interstate and For. Commerce.	Passed by House; in Sen. Com.	.....
HR. 10598.					
HR. 10645.	McClintic (Dem.) Okla.	Blue Sky regulation by Federal Trade Commission.	Interstate and For. Commerce.	In Committee.	
S. 2312.	Walsh (Dem.) Mont.	Lease of Indian reservations for mining purposes.	Public Lands.	Passed by Senate; in House.	.....
HR. 10668.	Carter (Dem.) Okla.	Leasing of Indian lands in Okla.	Indian Affairs.	In Committee.	
S. 3274.	Warren (Rep.) Wyo.	Amends Leasing Law.	Public Lands.	In Committee.	.....
S. 3240.	Smoot (Rep.) Utah.	Final patent on lands.	Public Lands.	In Committee.	
SJ. 147.	Pittman (Dem.) Nev.	Extends time to carry on drill operations.	Public Lands.	In Committee.	.....
S. 3238.	Smoot (Rep.) Utah.	Amending laws regarding land entries.	Public Lands.	In Committee.	.....
SJ. 157.	Oddie (Rep.) Nev.	To extend time for mine assessment.	Public Lands.	In Committee.	.....
HR. 10563.	Swing (Rep.) Calif.	Mining in unallotted lands in Indian reservations.	Indian Affairs.	In Committee.	.....
SJ. Res. 166.	Stanfield (Rep.) Ore.	Suspension of mine assessment requirement.	Mines and Mining.	In Committee.	.....
S. 2655.	King (Dem.) Utah.	Permit location of mining claims in national parks.	Public Lands.	In Committee.	.....
HR. 11549.	Kahn (Rep.) Calif.	Places Interior Dept. in charge of production and conservation of helium; appropriates $5,000,000. Hearings held July 1922.	Public Lands.	In Committee.	.....
S. 3519.	Bursum (Rep.) N. M.	Creates national park in Indian Reservation, N. M.	Public Lands.	Passed by Senate.	.....
HR. 11789.	Raker (Dem.) Calif.	Govt. to pay taxes to states for Govt. property within states.	Public Lands.	In Committee.	.....
HR. 10773	Gensman (Rep.) Okla.	Appraisal of taxable valuation of Indian Lands.	Indian Affairs	In Committee.	.....
HR. 10800	Sutherland (Rep.) Alaska	Development of resources of Alaska; appropriates $5,000,000.	Territories	In Committee.	.....
S. 71	Sinnott (Rep.) Ore.	Consolidation of offices of registers and receivers of land offices.	Public Lands	.....	Enacted into law.
		TARIFF			
HR. 7456.	Fordney (Rep.) Mich.	General revision upward.	Ways and Means and Finance.	Passed House July 1921. Passed Senate Aug. 19, 1922.	In Conf.
S. 3199.	Frelinghuysen (Rep.) N. J.	Transferring Tariff Commission to Commerce Department. Appropriates $1,000,000.	Finance.	.....	Rejected.
		REVENUE			
HR. 8245.	Fordney (Rep.) Mich.	Tax reduction and revision.	Ways and Means and Finance.	.....	Enacted into law.
S. 2687.	Pomerene (Dem.) Ohio.	Creation of Court of Internal Revenue Appeals.	Finance.	In Committee.	.....
SJ. 136.	King (Dem.) Utah.	Conference to consider Federal and state taxation.	Finance.	In Committee.	.....
HJ.Res. 314.	Green (Rep.) Iowa.	Taxing Federal and state securities; hearings held.	Ways and Means	In House.	.....
HR. 10055.	Frear (Rep.) Wis.	Tax on gifts.	Ways and Means.	In Committee.	.....
HJ.Res 346.	Layton (Rep.) Del.	Prohibition of levying taxes except for actual expenses of war.	Ways and Means.	In Committee.	.....
. 3746.	King (Dem.) Utah.	Tax on debts.	Banking and Cur.	In Committee.	.....

MONETARY

Bill	*Introduced by*	*Purpose*	*Referred to Committee*	*Present Status*	*Final Action*
SJ. Res. 139.	Nicholson (Rep.) Colo.	Investigation of values and relative values.	Finance.	In Committee.	
HR. 11788.	Goldsborough(Dem.)Md.	Stabilize the purchasing power of money.	Bank. and Cur.	In Committee.	
SJ. Res. 150.	France (Rep.) Md.	International Economic Conference.	Bank. and Cur.	In Committee.	
HR. 8404.	McFadden (Rep.) Pa.	International Exchange; hearings held.	Bank. and Cur.	In Committee.	

COAL

S. 2558.	Kenyon (Rep.) Iowa.	Punish profiteering in coal.	Manufactures.	In Committee.	
S. 2557.	Kenyon (Rep.) Iowa.	Facts about coal industry.	Manufactures.	In Committee.	
HR. 8405.	Newton (Rep.) Minn.	To gather information regarding coal industry.	Interstate and For. Commerce.	In Committee.	
HR.10001.	Thomas (Dem.) Ky.	Appropriation of $500,000 to suffering miners.	Mines and Mining.	In Committee.	
H. Res. 283.	Robsion (Dem.) Ky.	Investigation of conditions in coal industry.	Rules.	In Committee.	
HR. 11022.	Bland (Rep.) Ind.	Commission to investigate conditions in coal industry; hearings held April 1922.	Labor.		Rejected.
HR.11607.	Petersen (Rep.) N. Y.	Coal cost investigation.	Mines and Mining.	In Committee.	
HJ.Res.362.	Burke (Rep.) Pa.	Authorizing President to take over and operate coal mines for one year.	Mines and Mining.	In Committee.	
HJ.Res.363	Fish (Rep.) N. Y.	To investigate coal strike.	Labor.	In Committee.	
S. 3193.	Elkins (Rep.) W. Va.	Refund of fines under Fuel Control Act.	Claims.		Adversely reported.
S. 2788.	Poindexter (Rep.) Wash.	Prohibiting wasting of necessities of life.	Interstate Commerce.	In Committee.	

LABOR

S. 3147.	Kenyon (Rep.) Iowa.	To provide settlement of disputes between employes and employers.	Labor.	In Committee.	
S. 2749.	Kenyon (Rep.) Iowa.	To prepare for future periods of depression and unemployment; hearings held.	Labor.		Rejected.
HR. 10353.	Nolan (Rep.) Calif.	To prepare for future periods of depression and unemployment.	Labor.	In Committee.	
HC. Res. 53	Volstead (Rep.) Minn.	Employment of prisoners.	Judiciary.	In House.	
HR. 11155.	Zihlman (Rep.) Md.	Creating Asst. Secy. of Labor.	Labor.		Enacted into law.
S. 3396.	Dupont (Rep.) Del.	Creating Assistant Secy of Labor.	Appropriations		Enacted into law.
HR. 11956.	Hull (Rep.) Iowa.	Wages of Govt. artisans.	Labor.	In Committee.	
HR. 11707.	Huddleston (Dem.) Ala.	Prohibit marketing of articles produced by child labor.	Interstate Commerce.	In Committee.	
HJ. Res. 234.	Nolan (Rep.) Calif.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ. Res. 332.	Perlman (Rep.) N. Y.	Constitutional Amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ. Res. 34.	Tague (Dem.) Mass.	Constitutional Amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
SJ.Res.224.	Townsend (Rep.)Mich.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ.Res 355.	Voigt (Rep.) Wis.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ.Res.367.	Moore (Rep.) Ohio.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ.Res.368.	Foster (Rep.) Ohio.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HJ.Res.370.	Thompson (Rep.) Ohio.	Constitutional amendment to prevent child labor; hearings held June 1922.	Judiciary.	In Committee.	
HR. 12065.	Madden (Rep.) Ill.	Railroad wages.	Interstate Commerce.	In Committee.	

INDUSTRY

HR. 8421.	Herrick (Rep.) Okla.	Forbid scrip payment.	Bank. and Cur.	In Committee.	
HR. 10967.	Hull (Rep.) Iowa.	Manufacture of Govt. materials in Federal plants.	Rivers and Harbors.	In House.	
S. Res. 138.	Harreld (Rep.) Okla.	Investigation of oil monopoly.	Commerce.	In Committee.	
SJ.Res.311.	King (Dem.) Utah.	Investigation of certain oil companies..	Public Lands.		Adopted by Senate
HR. 11156.	McArthur (Rep.) Ore.	Regulation of trade associations.	Judiciary.	In Committee.	
S. 3385.	Edge (Rep.) N. J.	Regulation of trade associations.	Commerce.	In Committee.	
HJ.Res.301.	McArthur (Rep.) Ore.	Commission to investigate trade associations.	Judiciary.	In Committee.	
SJ. Res. 188.	Edge (Rep.) N. J.	Commission to investigate trade associations.	Commerce		Rejected.

MOVING THE CAPITAL TO THE MINING MAN'S DOOR

A mine operator can be in only one place at a time.

* * *

No matter how vital it be that he keep in close contact with developments in Washington affecting his business, he must depend upon other eyes and ears than his own to furnish him with details of current governmental activities.

* * *

A vigilant information service is placing fresh mining news at the disposal of the industry each morning.

THE INCREASING complexity of relations between the government and industry has brought a proportionate growth in the economic importance of developments "at Washington." The movement of each wheel in the machinery of the government now is of more vital interest to the industry of the country than ever before.

An Economic Aftermath

This condition has been more pronounced since the days of the war when a system of practical governmental regulation or supervision of business was of necessity developed as a measure of national defense. While practically all of the war laws have been repealed, a touch of this governmental supervision remains along certain lines. Each separate branch of industry finds the executive, legislative and administration departments of the government constantly taking actions in which it is vitally concerned and of which it must be ultimately informed. Otherwise, the business of the country would grope in blindness, not knowing what unforecasted turn of affairs might come upon it.

To meet the need of the mining industry for a reliable and accurate supply of information from Washington, the American Mining Congress nearly three years ago established an Information Service as a separate division of its organization.

Through this division, daily bulletins which report all phases of governmental activity affecting the mining industry are sent to members of the organization who desire this service. A weekly summary of this news is sent to all members. This bulletin service is supplemented on request by telephonic or telegraphic communication.

Members also are furnished with copies of bills and other documents before Congress, as well as court decisions, departmental rulings and other similar sources of information, with interpretations and such other details as are desired.

Accuracy is the Creed

In the preparation of information by this division, the highly sensational newspaper aspects are minimized, the object being to present information and not news, readers of the bulletin being able to secure the latter through the current press accounts. The Information Division places itself in the position of the member of the American Mining Congress and seeks to visualize for him that type of data which has a direct bearing on his business, and which he, as a general rule, is unable to obtain in any other manner.

In the collection and compilation of this information a constant daily contact is maintained by the Information Division with all sources of government information in Washington. Propaganda is never indulged in. The proceedings of Congress are carefully observed and every bill studied to obtain its correct interpretation as to its possible effect on the mining industry. Bills are reviewed within the day of their presentation to Congress and the successive stages in their consideration followed, including the committee hearings thereon, reports of committees to the House or Senate and the discussions of the measures by members of the House and Senate during the floor debates. The important departmental regulations promulgating provisions of enacted measures also are fully reported.

The decisions of the Supreme Court and other courts having cases of national interest are reported the day they are handed down. Contact is constantly maintained with cabinet officers and chiefs of bureaus of various departments having any jurisdiction over matters affecting the mining industry.

Supplemental Service Given

The service is of special value in cases where members desire information additional to that contained in the bulletin in connection with certain developments or events in which they are especially interested. Under these circumstances the division's efforts are so directed as to secure every available fact.

Details of information carried in the daily and weekly bulletins often are the subjects of inquiries by executives of government bureaus, and thus a liaison of benefit to both the government and the industry is established.

Aside from their value as distributors of current news, the bulletins also form permanent records when bound for file purposes, being issued upon sheets of paper perforated for use in loose-leaf binders. Many members now possess

E. H. PULLMAN

Chief, Information Service, American Mining Congress

files, including every bulletin issued since the service was established and thus have at their disposal the means of reviewing the progress of legislative action and other developments affecting the mining industry.

COAL ANALYSIS RESULTS

RESULTS of analyses of hundreds of coals from 25 states and the Territory of Alaska are given in bulletin 193, "Analyses of mine and car samples of coal collected in the fiscal years 1916 to 1919," just issued by the Bureau of Mines. Information as to the heating values of all coals tested is also given in the bulletin, which should be of interest to all extensive users of coal fuel.

Many mine samples of coal are analyzed each year in the laboratories of the Bureau of Mines. The analyses are made in connection with investigations relating to fuels belonging to or for the use of the United States Government, the causes of accidents in coal mines, the geologic relations of coal beds, and the quality and the value of the coal and lignite in the public lands. The systematic collection and analysis of such samples in connection with fuel investigations was begun in 1904, at the government fuel-testing plant at the Louisiana Purchase Exposition, and was under the direction of the United States Geological Survey for six years.

NATIONAL LEGISLATION

By E. H. Pullman

LEGISLATION DESIGNED to clear up conflicting issues in the coal situation occupied most of the attention of Congress during the month. President Harding in a special message to Congress, recommended the enactment of laws to regulate the distribution of coal in order to prevent unreasonable prices, and for investigation of the industry with a view of seeking means of bringing about more stable conditions about which there has been much discussion during the past several years. He also recommended a government agency to purchase, sell and distribute coal, but this was abandoned. Congress promptly proceeded to carry out his recommendations and both the Senate and House passed bills creating a coal commission and authorizing government regulation of distribution of coal under a federal fuel distributor and through priority and embargo orders of the Interstate Commerce Commission. The coal commission bill as passed by the House provides for a commission of nine members while the measure passed by the Senate provides for a commission of five members. The bills are in conference to adjust Senate amendments. Detailed investigations are to be made by the commission, which will make a report January 1 next, and a final report within a year from its creation when the commission will automatically expire. The bill was drafted by the Senate and House Interstate Commerce Committees after conferences with the President and the temporary presidential coal committee headed by Secretary of Commerce Hoover.

Opposition to Bill

There was considerable opposition in both Houses to passage of this legislation but on the final vote only a few members lined up against it, as it was realized that the legislation was temporary in character and could not well be refused in view of the critical situation confronting the country due to shortage of coal caused by the five months' strike. Bills were introduced authorizing the President to take over coal mines but as the strikes terminated no action was taken thereon, although the President indicated that he would have no objection to Congress taking such action as it might be wise to provide for future contingencies, but gave assurances that no exercise of the authority would be taken except as a last resort. A bill was introduced to conserve coal by limiting and restricting the conduct of non-essential activities but no action was taken on this matter.

Anti-Strike Legislation

Other legislation introduced in connection with the railroad and coal strikes proposed to transfer from the Railroad Labor Board to the Interstate Commerce Commission the authority to prescribe wages for railroad employes. A bill was also introduced to deport aliens who participate in riotous gatherings. Another measure was presented and reported by committee to punish those who send letters through the mails threatening destruction of the government, bodily harm or destruction of property. A bill was also introduced imposing penalties for destruction of trains. Legislation was proposed to prevent the issuance of injunctions against labor organizations to counteract the action of the government in obtaining an injunction at Chicago to prevent interference with the transportation system. An unsuccessful attempt was made in the House to impeach Attorney General Daugherty for obtaining the injunction.

Mining Bills

Senator Pittman, Dem., of Nevada, introduced a bill to extend the war minerals relief act to antimony producers. Several bills were introduced for the relief of placer mining claimants in the Red River, Oklahoma, region who were recently dispossessed by the Supreme Court decision holding that these lands were not subject to placer mining locations. Bills were introduced to grant permits and leases to persons thus affected.

Tariff and Bonus

The month was devoted by Senate and House conferees to consideration of Senate amendments to the revised tariff bill. Upon completion of their labor, the reports will be acted on by both Houses and early enactment of this law is expected. The Senate also completed the passage of the Soldier Bonus bill which, however, entails no additional taxes, and this measure is now in conference to adjust Senate amendments.

In consideration of the bonus bill by the Senate that body defeated an amendment by Senator Smoot, Rep., Utah, to impose a sales tax to raise revenue to finance the bonus.

The Alaskan Engineering Commission submitted to Congress its report for 1921 which dealt with general mining conditions and more particularly, with the blocking out of coal deposits and the production of coal for possible Navy use.

Additional Judges Provided

The Senate adopted the conference report on the bill creating twenty-five additional federal judges in the various states and the only remaining action to complete enactment of the legislation will be the adoption of the report by the House and approval of the law by the President.

The House Committee on Claims reported a bill to pay increased compensation to employes of the Bethlehem Steel Co. under an award made during the war by the War Labor Board.

The Senate passed a bill already passed by the House which now goes to the President authorizing the Interior Department to contract with firms or individuals for the preparation of amended income tax returns of the five civilized tribes of Indians in Oklahoma for 1919, 1920 and 1921. This action was taken on representation that the Indians had not been given proper depletion allowance. Those preparing the returns will be paid not more than 10 percent of the taxes saved the Indians by depletion deductions.

Congress passed and the President approved a law giving government sanction to an exhibition of mine and other products at Philadelphia in 1926 in cele-

IMPORTANT BILLS REVIEWED IN THIS ISSUE

MINING—
S. 3943: By Pittman (D) Nev. (Relief Antimony Producers)
COAL—
H. R. 12377: By Winslow (R) Mass.
S. 3865: By Borah (R) Idaho.
By Dickinson (R) Iowa. (Coal Commission)
H. R. 12472: By Winslow (R) Mass.
S. 3940: By Cummins (R) Iowa. (Coal Distribution)
S. 3954: By Edge (R) N. J.
S. J. R. 236: By Walsh (D) Mass. (Government Seizure Mines)
H. Res. 415: By Brennan (R) Mich. (Coal conservation)
H. Res. 417: By Moore (D) Va. (Coal legislation)
S. 3193: By Elkins (R) W. Va. (Fuel claims)
S. 1771: Fuel Station.
OIL—
S. Rep. 877: By McNary (R) Ore. (Prices)
H. R. 12446: By Appleby (R) N. J.
S. 3968: By Frelinghuysen (R) N. J. (Pollution prevention)
S. 3982: By Phipps (R) Colo.
S. 3959: By Watson (R) Ind.
H. R. 12492: By Sanders (R) Ind.
H. R. 12544: By Vaile (R) Colo. (Leases)
LABOR—
H. R. 12559: By Huddleston (D) Ala. (Injunctions)
H. R. 12376: By Dickinson (R) Iowa
H. R. 12346: By Ward (D) N. C. (Railroad wages)

bration of the 150th anniversary of the Declaration of Independence.

The Senate Committee on Manufactures conducted an investigation as to the price of crude oil and gasoline and made a preliminary report saying that reduced prices of crude oil justify a reduction in gasoline prices.

Oil Pollution Bill Passed

A step to prevent discharge of oil into navigable streams was taken when the Senate passed a bill on this subject, the measure to be administered by the War Department. A bill was also introduced in the House to forbid the discharge of oil into navigable waters and also authorizing the Department of Commerce to investigate to determine other substances whose discharge into waters would endanger or interfere with commerce or fisheries.

Establishment in various states of engineering experiment departments to promote engineering and industrial research was proposed in a bill introduced in the House.

Both Houses passed a bill which is now before the President extending section 18a of the leasing law to lands in Utah embraced in executive withdrawal of October 4, 1909, for one year after passage of the bill.

The House considered but did not act on the bill to grant states 20 percent of receipts of royalties on naval petroleum reserves, postponement of action being due to objections raised by several members.

The Senate Committee on Claims adversely reported a bill which would authorize the refund of fines imposed for violation of section 4 of the Lever Food and Fuel control law which was in force during the war.

MINING

Antimony Producers

S. 3943. Introduced by Mr. Pittman, Dem., Nevada; referred to the Committee on Mines and Mining. This bill amends the War Minerals Relief act by giving authority to adjust claims of antimony producers, the original act having applied only to manganese, chrome, pyrites and tungsten.

COAL

Investigating Commission

H. R. 12377. Introduced by Mr. Winslow, Rep., Massachusetts; reported by the Interstate Commerce Committee and passed by the House. This bill proposes the appointment by the President of a United States Coal Commission of not more than nine members to secure information in connection with questions relative to interstate commerce in coal. The Commission will continue for one year, making a preliminary report January 1, 1923, with recommendations as to methods and measures to promote the continuity of production and efficiency in mining and distribution and maintain an uninterrupted movement of coal. The Commission would ascertain facts as to ownership of coal mines, price of coal, mine wages, wage contracts, conditions of employment, distribution, waste of coal, profits realized by owners or operators or other persons or corporations dealing in production, distribution and sale of coal and any other facts in connection with the coal industry, including organizations and persons connected with it. The commissioners would have authority to examine witnesses and require the production of books and papers under heavy penalties. The bill provides an appropriation of $300,000 for the expenses of the commission.

S. 3865. Introduced by Mr. Borah, Rep., Idaho; reported by the Committee on Labor, substituted for the foregoing bill and passed by the Senate. This bill while similar in character differs in some respects, providing for a commission of five members and for reports as to standardizing mines and living conditions and the advisability and wisdom of nationalizing the coal industry.

Distribution

H. R. 12472. Introduced by Mr. Winslow; reported by the Interstate Commerce Committee, and passed by the House. This bill declares a national emergency due to the coal strike, enlarges the powers of the Interstate Commerce Commission to permit the application of priorities and embargoes in distribution of coal and provides for the appointment of a Federal Fuel Distributor to prevent extortion in the sale of fuel. The Fuel Distributor would ascertain the available supply of coal and other fuel, the extent of shortage, fields of production, principal markets, means and methods of distribution, price, etc.

The Commission would issue orders for priorities in car service, embargoes and other measures in favor of or against any railroad, region, community, person or corporation and take other steps for the adequate distribution of coal or other fuel to meet the emergency and prevent extortion in prices. Exercise of the powers would be suspended upon proclamation of the President. In future emergencies, the President could proclaim an emergency and revive the powers of the law. Abuse of priority orders by the distribution of fuel for purpose other than those for which the order was issued would subject the offender to a fine of not less than $1,000 or not more than $20,000. The bill ap-

propriates $250,000 for expenses and except as to prosecution for offences the law would cease to be effective January 1, 1924.

S. 3940. Introduced by Mr. Cummins, Rep., Iowa; reported by the Interstate Commerce Committee, substituted for the foregoing and passed by the Senate.

This bill is of similar import as the foregoing, except that it contains no penalties for violation of the priority orders.

H. R. 12469. Introduced by Mr. Dickinson, Rep., Iowa; referred to the Committee on Interstate Commerce. This bill proposes a coal commission of four members to serve during the emergency but not longer than six years, to investigate the coal industry, to encourage operators and miners to agree on wage scales and failing such agreement to fix such wage scales. The bill also proposes that operators shall not receive prices which would yield more than 10 percent return on their investment based on the actual appraised value. The Commission would also be authorized to direct the sale of coal to relieve the emergency.

Mine Seizure

S. 3954. Introduced by Mr. Edge, Rep., N. J.; referred to the Committee on Interstate Commerce. This bill proposes to give authority to the President to acquire by condemnation or otherwise, coal mines necessary to meet the existing emergency.

S. J. Res. 236. Introduced by Mr. Walsh, Dem., Massachusetts: referred to the Committee on Interstate Commerce. This resolution would authorize the President to take over and operate for the government coal mines of the country and appropriating $1,000,000 therefor.

Fuel Conservation

H. Res. 415. Introduced by Mr. Brennan, Rep., Michigan; referred to the Committee on Interstate Commerce. This bill proposed to conserve coal by limiting and restricting the conduct of non-essential activities.

Committee Investigation

H. Res. 417. Introduced by Mr. Moore, Dem., Virginia; referred to the Committee on Rules. It requests the Judiciary Committee to consider and report without delay what legislation may be enacted with reference to the existing emergency and any similar emergency that may occur which will bring about an exercise of the power possessed by the government for protecting and safeguarding the interests of the public.

War Claims

S. 3193. Introduced by Mr. Elkins, Rep., West Virginia; referred to the Committee on Claims. This bill which proposed to refund to persons or corporations fines imposed for violation of section 4 of the Lever Food and Fuel control law of August 10, 1917, has been adversely reported by the Committee and indefinitely postponed.

Fuel Station

S. 1771. Passed by Senate and reported to the House by the Committee on Merchant Marine. This bill appropriates $50,000 for the acquisition of fourteen acres of land on Hazzell Island, St. Thomas, Virgin Islands, for the establishment of a fuel and fuel oil station for the Shipping Board, naval and other merchant vessels. The station is designed to meet the requirements of vessels traveling to Africa and the east coast of South America.

OIL

Price Inquiry

S. Report 877. Made by Mr. McNary, Rep., Oregon, from the Committee on Manufactures. This is a preliminary report on the investigation being conducted by the committee as to prices of crude oil and gasoline. The report says that sudden and violent fluctuations in the price of crude oil spell disaster for many of the thousands of small independent producers. The committee says that the recent reduction from $2 to $1.25 per barrel in the price of crude oil justifies a further reduction in the price of gasoline.

Pollution

S. 3968. Introduced by Mr. Frelinghuysen, Rep., N. J.; reported by the Committee on Commerce, passed by the Senate. This bill repeals former laws and substitutes a new act to be administered by the War Department to prevent the discharge of oil into navigable waters of the United States. The former law which referred to discharge of materials which will impede or obstruct navigation, was construed by courts in several cases as not applying to the discharge of oil. The bill forbids the discharge by any floating craft of oil into navigable waters except for the purpose of smoothing the sea or quelling the force of the waves in an emergency and except as otherwise permitted by regulation of the War Department.

H. R. 12446. Introduced by Mr. Appleby, Rep., N. J.; referred to the Committee on Rivers and Harbors. This bill proposes to place under jurisdiction of the Department of Commerce the control of discharge from floating craft or from shore, wharf, manufacturing establishment or mill of any kind any refuse matter of any kind or description including oil, oil sludge and oil refuse into any navigable water or tributary. The Secretary of Commerce may permit the deposit of such material whenever the refuse matter may have been proven to be harmless. The bill also authorizes the Secretary to investigate to determine what substances in addition to oil are deposited in navigable waters in such manner as to endanger or interfere with commerce or fisheries, reporting to Congress in two years with recommendations for legislation.

Leases

S. 3982. Introduced by Mr. Phipps, Rep., Colorado, by request; referred to the Committee on Public Lands. This bill authorizes the issuance of permits and leases to persons who made placer mining locations in the Red River, Oklahoma, region prior to October 1, 1919, and who were recently dispossessed by the Supreme Court decision holding that such lands were not subject to placer mining locations.

S. 3959. Introduced by Mr. Watson, Rep., Indiana; referred to the Committee on Public Lands. This is similar to the foregoing.

H. R. 12492. Introduced by Mr. Sanders, Rep., Indiana; referred to the Committee on Public Lands. This is similar to the foregoing.

H. R. 12544. Introduced by Mr. Vaile, Rep., Colorado; referred to the Committee on Public Lands. This is similar to the foregoing.

LABOR

Injunctions

H. R. 12559. Introduced by Mr. Huddleston, Dem., Alabama; referred to the Committee on Judiciary. This bill is an outgrowth of the government's injunction filed in Chicago to prevent interference with the transportation system by the railroad unions. The bill proposes that no officer, agent or employe of the government shall, under color or by means of his office or authority, wilfully deprive any person of his freedom of speech or other immunity under the Constitution and laws of the country. The bill defines as malfeasance in office the issuance of any injunction, order or other process depriving persons of such rights or immunities or to intimidate them to put them in fear.

Wages

H. R. 12376. Introduced by Mr. Dickinson, Rep., Iowa; referred to the Committee on Interstate Commerce. This bill provides that decisions of the Railroad Labor Board affecting wages or working conditions of railroad employes shall not become effective until 150 days after the decision or longer as the board may order.

H. R. 12346. Introduced by Mr. Ward, Dem., North Carolina; referred to the Committee on Interstate Commerce. This bill would confer authority on the Interstate Commerce Commission to prescribe wages for railroad employes.

Read on this page, from issue to issue, a description of the features which have made Prest-O-Lite a national institution

PREST-O-LITE

Why Prest-O-Lite Makes Its Own Cylinders

Prest-O-Lite delivers to the user a product that is Prest-O-Lite through and through.

The cylinder is made in a Prest-O-Lite factory specially equipped for cylinder manufacture. Prest-O-Lite engineering skill and inspection control every step in production.

Making cylinders to its own design, guarding every step, Prest-O-Lite knows that each cylinder measures up to its high standard resulting from years of experience in the manufacture and distribution of Dissolved Acetylene.

An inquiry at our nearest sales office will bring you information concerning our latest sales and service plans.

Each Prest-O-Lite user looks to his nearest District Sales Office not merely for arrangements to adequately cover acetylene needs, but for helpful co-operation and advice on any matter involved in the use of acetylene.

THE PREST-O-LITE COMPANY, Inc.

General Offices: Carbide and Carbon Building, 30 East 42nd Street, New York
Balfour Building, San Francisco; In Canada: Prest-O-Lite Co. of Canada, Toronto

DISTRICT SALES OFFICES

Pittsburgh	Chicago	San Francisco	St. Louis
Buffalo	Cleveland	Dallas	Boston
Milwaukee	Atlanta	Philadelphia	Detroit
		New York	

Prest-O-Lite

DISSOLVED ACETYLENE

BUYER'S DIRECTORY

ACID, SULPHURIC
Irvington Smelting & Refining Works, Irvington, N. J.

AERIAL TRAMWAYS
American Steel & Wire Co., Chicago and New York.

AERIAL TRAMWAY CABLE
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

AIR COMPRESSORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

ALTITUDE VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

AMALGAMATORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

APPLIANCES, ENGINEERING
Lunkenheimer Co., Cincinnati, Ohio.

ARMATURES
General Electric Co., Schenectady, N. Y.

ASSAYERS
Pennsylvania Smelting Co., Pittsburgh, Pa.

AUTOMATIC CAR CAGERS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

AUTOMATIC COAL SKIP
Roberts & Schaefer Co., McCormick Bldg., Chicago, Ill.

AUTOMATIC (Mine Doors, Truck and Electric Switches)
American Mine Door Co., Canton, Ohio.

BAROMETERS
Taylor Instrument Companies, Rochester, N. Y.

BATTERY-CHARGING EQUIPMENT
General Electric Co., Schenectady, N. Y.

BELTING (Conveyor, Elevator, Transmission)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

BELTING, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

BINS (Coke and Coal)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

BIT SHARPENERS
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

BLASTING POWDER
Hercules Powder Co., 934 King St., Wilmington, Del.

BLASTING SUPPLIES
Atlas Powder Company, Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

BLOWERS
General Electric Co., Schenectady, N. Y.

BLOWERS' CENTRIFUGAL
Ingersoll-Rand Co., 11 Broadway, New York City.

BOILER MOUNTINGS
Lunkenheimer Co., Cincinnati, Ohio.

BOILER STOP AND CHECK VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

BOILERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis. (feed pump).

BOXES, JOURNAL
J. R. Fleming & Son Co., Inc., Scranton, Penna.

BREAKERS (Construction and Machinery)
Jeffrey Mfg. Co., Columbus, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wilmot Engineering Co., Hazleton, Pa.

BRIQUETTING MACHINERY
Jeffrey Mfg. Co., Columbus, Ohio.
Traylor Eng. & Mfg. Co., Allentown, Penna.

BUCKETS (Elevator)
Jeffrey Mfg. Co., Columbus, Ohio.

CABLES (Connectors and Guides)
American Mine Door Co., Canton, Ohio.

CABLEWAYS
Jeffrey Mfg. Co., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CAGE (Safety Appliances)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

CAGES
Car-Dumper & Equipment Co., Chicago, Ill.
Connellsville Mfg. & Mine Supply Co., Connells ville, Pa.
Holmes & Bros., Robert, Inc., Danville, Ill.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CAR CONTROL AND CAGE EQUIPMENT
Car-Dumper & Equipment Co., Chicago, Ill.

CAR DUMPS
Car-Dumper & Equipment Co., Chicago, Ill.

CAR AND CAR WHEELS
Hockensmith Mine Car Co., Penn Station, Pa.

CAR-HAULS
Car-Dumper & Equipment Co., Chicago, Ill.

CASTINGS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
The Lunkenheimer Co., Cincinnati, Ohio.

CHAINS
Jeffrey Mfg. Co., Columbus, Ohio.
Morse Chain Co., Ithaca, N. Y.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, N. Y.

CHAINS, DRIVE
Morse Chain Co., Ithaca, N. Y.

CHAINS, FRONT END
Morse Chain Co., Ithaca, N. Y.

CHAINS, OILING
Morse Chain Co., Ithaca, N. Y.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N. Y.

CHAINS, SILENT (Rocker-Joint)
Morse Chain Co., Ithaca, N. Y.

CHAINS, SLING
Morse Chain Co., Ithaca, N. Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N. Y.

CHEMICALS
Roessler & Hasslacher Chemical Co., 709-717 Sixth Avenue, New York.

CHEMISTS
Hunt, Robt., & Co., Insurance Exchange, Chicago, Ill.

CIRCUIT BREAKERS
General Electric Co., Schenectady, N. Y.

CLAMPS (Trolley)
Ohio Brass Co., Mansfield, Ohio.

CLUTCHES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

COAL COMPANIES
Clinchfield Coal Corp., Dante, Va.
Lehigh Coal & Navigation Co., Philadelphia, Pa.
Stonega Coal & Coke Co., Philadelphia, Pa.
Thorne, Neale & Co., Philadelphia, Pa.
Wholesale Coal Co., Pittsburgh, Pa.

COAL CRUSHERS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., Columbus, Ohio.

COAL CUTTERS
Goodman Mfg. Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, Ohio.

COAL DRYING PLANTS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL HANDLING MACHINERY
Jeffrey Mfg. Co., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL MINING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL MINE POWER PLANTS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL MINING PLANTS
Ingersoll-Rand Co., 11 Broadway, New York City.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL WASHING PLANTS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COCKS (Locomotive, Cylinder and Gauge)
The Lunkenheimer Co., Cincinnati, Ohio.

COILS (Choke)
General Electric Co., Schenectady, N. Y.

COMPRESSORS, AIR
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.

COMPRESSORS, MINE CAR
Ingersoll-Rand Co., 11 Broadway, New York City.

CONCENTRATORS (Table)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONCRETE REINFORCEMENT
American Steel & Wire Co., Chicago and New York.

CONDENSERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

CONSULTING ENGINEERS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

CONTRACTORS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

CONTROLLERS
General Electric Co., Schenectady, N. Y.
Goodman Manufacturing Co., Halsted St. and 48th Place, Chicago, Ill.

CONVERTERS, COPPER
Traylor Eng. & Mfg. Co., Allentown, Penna.

CONVEYORS, BELT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CONVEYORS, CHAIN FLIGHT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Wilmot Engineering Co., Hazleton, Pa.

CONVEYORS, COAL
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CONVEYORS AND ELEVATORS
Jeffrey Mfg. Co., Columbus, Ohio.

CONVEYORS, PAN OR APRON
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

Twenty-Five Years of Service

NO résumé of the mining industry would be complete if it did not include the achievements of the petroleum industry, particularly those of the Standard Oil Company (Indiana).

The improved methods of mining, dependent almost entirely as they now are on mechanical needs, have been possible only because of constant progress in the petroleum industry.

Twenty-five years ago conditions were much different than they are now. With the appearance of each new labor-saving device, the lubricating experts of the Standard Oil Company (Indiana) compounded the right lubricants for their efficient operation. At that time, it was necessary to study carefully the different phases of operating conditions and to develop new oils and greases to keep pace with the mechanical progress within the mining industry.

Nowadays, however, so rich a heritage has been bequeathed us by the pioneers of our industry, that our work is no longer a matter of hesitant experimentation, but the application of standardized products for standardized users. Such trade-marked lubricants as are listed below, together with many others, are in daily use by some of the largest mines in the country.

SUPERLA GREASES
For mine car wheel lubrication.

SUPERLA CYLINDER OILS
A complete line of steam engine, cylinder and valve lubricants, made in grades suitable for any steam conditions.

ARIO COMPRESSOR OIL
For intermediate and high pressure air compressors of the plate and poppet valve type.

CALUMET GREASES
For use in compression cups and on open bearings.

SUPERLA TURBINE OIL
A non-emulsifying light, high grade oil for steam turbine use.

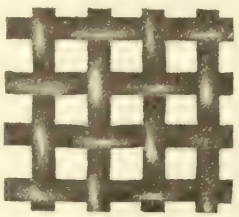
SUPERLA C. & G. COMPOUND
A dark, adhesive compound especially developed for gears, cables, wire ropes and chains.

One of our corps of lubricating engineers will be glad to confer with you and make a detailed survey of your lubricating requirements. He will point the way to correct, economical lubrication. You may avail yourself of his services without obligation.

STANDARD OIL COMPANY
(INDIANA)
910 Michigan Ave., Chicago, Ill.

"CLEVELAND" Double-Crimped Wire Cloth

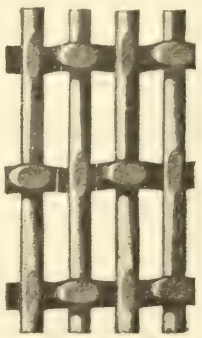
The Cleveland Wire Cloth & Mfg. Co.



3½ Mesh .135 Wire

Manufacturers of Mining Screens, Locomotive Stack Netting, Cement, Rice Mill, Centrifugal, Filter, Twilled, Steel, Tinned, Copper, Brass and Bronze Wire Cloth.

Renowned for its uniformity, its Superior Weave and its Durability. Particular Cloth for Particular People for all Purposes. A large stock of the various meshes always on hand.



No. 28 Rolled Slot

The Cleveland Wire Cloth & Mfg. Co.
3573 East 78th St., Cleveland, Ohio, U. S. A.

Pacific Tank and Pipe Co.

Manufacturers

Water Pipe, Tanks
Cyanide Plants

Los Angeles San Francisco
California

CONVEYORS, SCREW
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

COPPER ELECTROLYTIC
United Metals Selling Co., 42 Broadway, New York City.

COPPER WIRE
Anaconda Copper Mining Co., 111 W. Washington St., Chicago, Ill.

CORE DRILLING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.

CRUSHERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CRUSHERS, COAL
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CRUSHERS, JAW AND GYRATORY
Traylor Eng. & Mfg. Co., Allentown, Penna.

CRUSHING PLANTS, COKE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CYANIDE
American Cyanamid Co., New York, N. Y.
Roessler and Hasslacher Chemical Company, 709 Sixth Avenue, New York City.

DESIGNERS OF PLANTS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

DIAMOND CORE DRILL CONTRACTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros, Punxsutawney, Pa.

DOORS, AUTOMATIC MINE
American Mine Door Co., Canton, Ohio.

DRAG LINES
Denver Rock Drill Mfg. Co., Denver, Colo.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples Gas Bldg., Chicago, Ill.

DREDGES, GOLD AND TIN
New York Engineering Co., 2 Rector St., New York City.

DRIFTERS, DRILL
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., New York City.

DRILLS, AIR & STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Blast Hole)
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., New York City.

DRILLS, CORE
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., New York City.

DRILLS, ELECTRIC
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., New York City.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

DRILLS, HAMMER
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., New York City.

DRILLS (Hand Operated Coal)
Ohio Brass Co., Mansfield, Ohio.
Ingersoll-Rand Co., New York City.

DRILLS, PNEUMATIC
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., New York City.

DRILLS, PROSPECTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
New York Engineering Co., 2 Rector St., New York City.

DRILLS, ROCK
Denver Rock Drill Mfg. Co., Denver, Colo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., New York City.

DRILL STEEL SHARPENERS
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRIVES, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

DRUMS (Hoisting, Haulage)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

DRYERS, ORE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DUMPERS, ROTARY
Car-Dumper & Equipment Co., Chicago, Ill.

DUMP CARS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

DYNAMOS
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

EJECTORS
The Lunkenheimer Co., Cincinnati, Ohio.

ELECTRICAL APPARATUS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

ELECTRICALLY OPERATED VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

ELECTRIC HOISTING MACHINERY
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELECTRIC LOCOMOTIVES
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Ohio Brass Co., Mansfield, Ohio.

ELECTRIC MINE SUPPLIES
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

ELECTRICAL SUPPLIES
General Electric Co., Schenectady, N. Y.

ELEVATORS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELEVATORS, BUCKET
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELEVATOR CABLES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

ELEVATOR MACHINERY
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

EMERGENCY TRIP VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

ENGINE STOP VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

ENGINE TRIMMINGS
The Lunkenheimer Co., Cincinnati, Ohio.

ENGINEERING APPLIANCES
The Lunkenheimer Co., Cincinnati, Ohio.

ENGINES
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

ENGINES, GAS AND GASOLINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ENGINES (Hoisting and Hauling)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

ENGINES, OIL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand, 11 Broadway, New York City

ENGINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ENGINEERS
H. R. Ameling Prospecting Co., Rolla, Mo.
Hunt, Robert & Co., Insurance Exchange, Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Du Pont Powder Co., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

FANS, VENTILATING
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.

FEEDERS, ALL TYPES
Traylor Eng. & Mfg. Co., Allentown, Penna.

FEEDERS, ORE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

FILTERS (Water)
Wm. B. Scaife & Sons Co., Oakmont, Pa.

FLOTATION OILS
Hercules Powder Co., 934 King St., Wilmington, Del.

FLOW METERS
General Electric Co., Schenectady, N. Y.

FORGINGS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FROGS AND SWITCHES
Central Frog & Switch Co., Cincinnati, Ohio.

FURNACES, MECHANICAL ROASTING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FURNACES, SMELTING
Traylor Eng. & Mfg. Co., Allentown, Penna.

GEARS
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.

GEARS, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

GENERATORS AND GENERATING SETS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

GUY LINES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

HANGERS (Insulated Trolley)
Ohio Brass Co., Mansfield, Ohio.

HARDWARE
Wood Shovel & Tool Co., Piqua, O.

HEADLIGHTS, ARC AND INCANDESCENT
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

HOISTS, ELECTRIC
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOISTS, PORTABLE
Ingersoll-Rand Co., 11 Broadway, New York City.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTS, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOISTS (Room & Gathering)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Holmes, Robert & Bros., Inc., Danville, Ill.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTING ROPES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

HOSE, AIR & STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

HYDRAULIC MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Car-Dumper & Equipment Co., Chicago, Ill.
Traylor Eng. & Mfg. Co., Allentown, Penna.

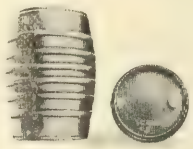
HYDROMETERS
Taylor Instrument Companies, Rochester, N. Y.

P.I.W.
STEEL PLATE CONSTRUCTION

FOR AMERICA'S MINING INDUSTRY

We have designed, fabricated and erected the following heavy steel plate products:

STORAGE TANKS
SMOKE STACKS
STAND PIPES
FLUES and FLUMES
COAL CHUTES
RIVETTED STEEL PIPE
PENSTOCKS
HOPPERS and BINS



The "GEM" Bilged Steel Barrel

Twenty-Fifth Annual Convention Delegates of the American Mining Congress are cordially invited to visit and inspect our General Offices and large plant at Sharon, Pa.—only 80 miles from Cleveland.

Secure a P. I. W. Quotation first on your next Steel Plate Mining Equipment.

THE PETROLEUM IRON WORKS CO.
SHARON, PENNSYLVANIA

NEW YORK ST. LOUIS TULSA HOUSTON DENVER
SAN FRANCISCO TAMPICO

667

The National Fuse and Powder Co.

MANUFACTURERS OF

"NATIONAL"
BRAND SAFETY FUSE

For Use In All Blasting Operations

Office and Factory
Denver, Colorado

Used Mine Machinery

Anything from a complete Plant down to the smallest piece of Mining Machinery can be supplied from our stock of used equipment—and you save a large amount of money when you purchase it.

ROLLS
1—Set 36x16 Power & Mining Machinery Co.
1—Set 36x16 Davis.
2—Set 30x14 Power & Mining Machinery Co.
1—Set 27x14 McFarlane.
2—Set 27x14 Davis.
1—Set 27x11 Walker.
3—Set 20x12 McFarlane.
2—Set 20x12 Stearns-Roger.

BALL MILLS
1—8′x6′ Gates.
1—6′x6′ Allis Chalmers.
1—5½′x6′ Standard.
1—6′x16″ Hardinge.
2—5′x4′ Standard.
1—4′x4′ Standard.
2—4′x3′ Standard.
1—3′x3′ Standard.

TUBE MILLS
2—5′x22′ Allis Chalmers, Steel Lined.
1—5′x16′ Allis Chalmers, Silex Lined.
1—5′x14′ Allis Chalmers, Silex Lined.
1—6′x12′ Allis Chalmers, Silex Lined.
2—4½′x12′ Allis Chalmers, Silex Lined.

FILTERS
1—14′x12½′ Portland.
1—14′x12′ Oliver.

FILTERS—Continued
4—12′x9′ Portland.
2—12′x8′ Portland.
1—12′x7½′ Portland.
2—No. 850 Kelly Filters.
6—No. 450 Kelly Filters.
1—24″x24″ Perrin, 55 plates.
1—24″x24″ Johnson, 55 plates.
11—6′x6′ Filter Leaves.
12—5.4″x4.6″ Filter Leaves.

THICKENER MECHANISMS
1—40′x7′ Thickener Mechanisms, with steel tank.
2—40′x12′ Thickener Mechanisms, with trays.
2—36′x12′ Thickener Mechanisms, with trays.
2—30′x10′ Thickener Mechanisms, with steel tanks.

We have a large number of both steel and wood tanks which we can arrange for use with above.

AGITATORS
6—10x10 Dorr Agitators with steel tanks.

TRAMWAYS
1—16 2-3 Mile Leschen Tramway; Cap. 10 tons.
1—8-mile, same as above.
1—4-mile, same as above.
1—1½-mile Leschen Tramway; Cap. 20 tons.
1—1-mile Bleichert Tramway; Cap. 10 tons.

Send for our complete machinery STOCK LIST

The Morse Bros. Machinery & Supply Co.
1750 WAZEE STREET DENVER, COLO.

HYGRODEIKS
Taylor Instrument Companies, Rochester, N. Y.

INDUSTRIAL HOUSING
General Electric Co., Schenectady, N. Y.

INJECTORS
The Lunkenheimer Co., Cincinnati, Ohio.

INSTRUMENTS, ELECTRICAL
General Electric Co., Schenectady, N. Y.

INSULATING MATERIAL, ELECTRIC
General Electric Co., Schenectady, N. Y.

INSULATING TAPE AND CLOTH
General Electric Co., Schenectady, N. Y.

INSULATORS, FEEDER WIRE
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS, SECTION
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Porcelain)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Third Rail)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Trolley)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATED WIRE AND CABLE
American Steel & Wire Co., Chicago, Ill.
Roebling Sons, John A., Trenton, N. J.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples Gas Bldg., Chicago, Ill.

JOURNAL BOXES
J. R. Fleming & Son Co., Inc., Scranton, Pa.

KILNS (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

KILNS (Rotary Ore Nodulizers)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

LAMPS, ARC AND INCANDESCENT
General Electric Co., Schenectady, N. Y.

LAMPS (Carbon)
General Electric Co., Schenectady, N. Y.

LAMPS, ELECTRIC
General Electric Co., Schenectady, N. Y.

LEAD ORES
American Zinc, Lead & Smelting Co., 1012 Pierce Bldg., St. Louis, Mo.

LIGHTNING ARRESTERS
General Electric Co., Schenectady, N. Y.

LOADING BOOMS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

LOADING MACHINES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

LOCOMOTIVE COALING STATIONS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

LOCOMOTIVES, ELECTRIC
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Chicago, Ill.
Ironton Engine Co., Ironton, Ohio.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

LOCOMOTIVES, GASOLINE
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, RACK RAIL
Goodman Mfg. Co., Chicago, Ill.

LOCOMOTIVES, STEAM
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, STORAGE BATTERY
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Chicago, Ill.
Ironton Engine Co., Ironton, Ohio.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

MACHINERY, TRANSMISSION (Power)
Morse Chain Co., Ithaca, N. Y.

MILLS, BALL, TUBE, ROD, COMBINATION
Traylor Eng. & Mfg. Co., Allentown, Penna.

MILLS, STAMP
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINE CAR TRUCKS
J. R. Fleming & Son Co., Inc., Scranton, Pa.

MINE DOORS, AUTOMATIC
American Mine Door Co., Canton, Ohio.

MINING CABLES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

MINING EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.

MINING MACHINES
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

MINING MACHINES CHAIN AND PUNCHER
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

MINING MACHINES (Electric)
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

MINING MACHINERY
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

MINING SHOVELS
Wood Shovel & Tool Co., Piqua, O.

MINE CAR HITCHINGS
Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

MINE CAR TRUCKS
Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

MINE SIGNALS
American Mine Door Co., Canton, Ohio.

MOTOR CONTROL APPARATUS
General Electric Co., Schenectady, N. Y.

MOTORS
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Chicago, Ill.

MOUNTINGS, BOILER
The Lunkenheimer Co., Cincinnati, Ohio.

NODULIZERS, ORE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

NON-RETURN BOILER STOP VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

ORE, BUYERS AND SELLERS OF
Irvington Smelting & Refining Works, Irvington, N. J.
Phelps-Dodge Corporation, New York City.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.

PERMISSIBLES, Explosives
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

PICKING TABLES
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

PIG LEAD
Pennsylvania Smelting Co., Pittsburgh, Pa.
United Metals Selling Co., 42 Broadway, New York City.

PIPE, CAST IRON
Hockensmith Mine Car Co., Penn Station, Pa.

PIPE, GENUINE WROUGHT IRON
A. M. Byers Co., Pittsburgh, Penna.

PIPE (Wood)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PNEUMATIC TOOL
Ingersoll-Rand Co., 11 Broadway, New York City.

POWDER, BLASTING
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

POWER TRANSMISSION MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PROSPECTIVE DRILLS
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

PULVERIZERS, COAL AND COKE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

PUMPS, CENTRIFUGAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, MINE
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS (Electric)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PUMPS (Gathering or Dip)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PUMPS, PNEUMATIC AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, POWER
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, POWER DRIVEN TRIPLEX AND QUINTRIPLEX
Traylor Eng. & Mfg. Co., Allentown, Penna.

PUMPS, SAND
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, VACUUM
Ingersoll-Rand Co., 11 Broadway, New York City.

PYROMETERS
Taylor Instrument Companies, Rochester, N. Y.

QUARRYING MACHINERY
Ingersoll-Rand Co., 11 Broadway, New York City.

RAIL BONDS
American Steel & Wire Co., Chicago and New York.
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

RAILWAY SCOOPS
Wood Shovel & Tool Co., Piqua, O.

RAILWAY SUPPLIES
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

REDUCING VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

REGULATING VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

RELIEF VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

REGULATORS, TEMPERATURE AND PRESSURE
Taylor Instrument Companies, Rochester, N. Y.

ROCK DRILLS
Denver Rock Drill Mfg. Co., Denver, Colo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.

RODS, COPPER, HOT ROLLED
Anaconda Copper Mining Co., Rolling Mills Dept., 111 W. Washington St., Chicago, Ill.

ROLLING MILL MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Look 'em over at the Expo'

LUNKENHEIMER

Valves and
Engineering Appliances

ON DISPLAY IN SPACE 27

EXPOSITION
OF MINES AND MINE EQUIPMENT OF
THE AMERICAN MINING CONGRESS

Cleveland, Ohio, Oct. 9-14

28-16A-8

"America's Best Since 1862"

ROEBLING

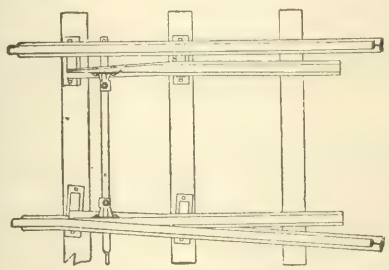
WIRE ROPE FITTINGS WELDING WIRE

John A. Roebling's Sons Company
Trenton, New Jersey

WIRE ROPE

CENTRAL
MINE TRACK EQUIPMENT

Instead of using 18 to 30-inch latches hammered out of square iron, in your blacksmith shop, use these long latches, cut from standard section rail and carefully planed to the correct shape. Keep your cars on the track—not in the ditch.

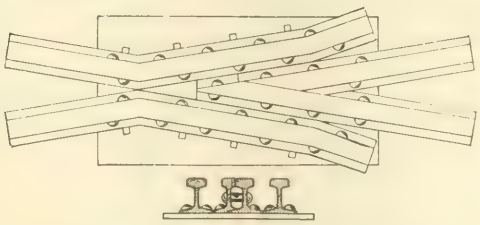


Split Switch

Frogs, too, are a prolific source of trouble to the mine manager. Despite the most careful hand work, if constructed in the ordinary way, they get out of line.

CENTRAL frogs are permanently riveted to heavy stee plates.

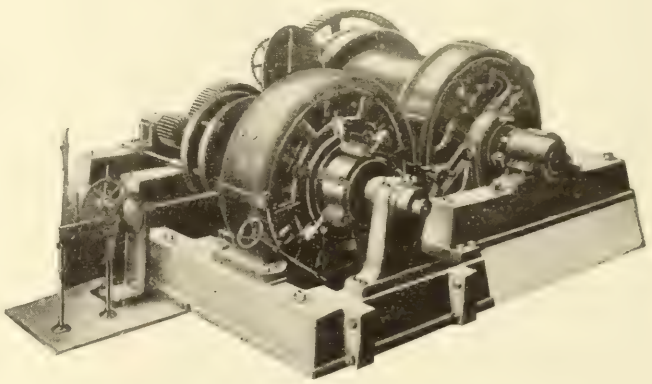
Riveted Plate Frog



THE CENTRAL FROG & SWITCH CO.
CINCINNATI, OHIO

The Connellsville Manufacturing and Mine Supply Company

Connellsville, Pa.



If you need any cost reducing mine equipment, write us.

The Cage, Hoist and Fan Builders

Irvington Smelting and Refining Works

Buyers, Smelters and Refiners of
Gold, Silver, Lead, Copper and Platinum Ores, Sweeps and Bullion

Manufacturers of Copper Sulphate

IRVINGTON :-: NEW JERSEY

NEW YORK OFFICE—Charles Engelhard
Hudson Terminal Building 30 Church Street

CORE DRILLING

H. R. AMELING PROSPECTING COMPANY, INC.

Diamond Drill Contractors
20 Years' Continuous Service
Not a Dissatisfied Customer

ROLLA, MISSOURI

Home: State Geologic Survey, Missouri School of Mines

ROLLS, CRUSHING
Traylor Eng. & Mfg. Co., Allentown, Penna.

ROPE, TRANSMISSION
American Steel & Wire Co., Chicago and New York.
Roebling Sons, John A., Trenton, N. J.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples' Gas Bldg., Chicago, Ill.

ROPE, WIRE
American Steel & Wire Co., Chicago and New York.
Roebling Sons, John A., Trenton, N. J.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples' Gas Bldg., Chicago, Ill.

ROTARY DUMPS
Car-Dumper & Equipment Co., Chicago, Ill.

SAFETY APPLIANCES, MINE
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

SCOOPS, RAILWAY
Wood Shovel & Tool Co., Piqua, O.

SCRAPER LOADERS
Goodman Manufacturing Co., Halsted St. and 48th Place, Chicago, Ill.

SCREENS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

SCREENS AND PERFORATED SHEETING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Perforating Co., Chicago, Ill.
Holmes & Bros., Inc., Robert, Danville, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

SCREENS, REVOLVING
Chicago Perforating Co., Chicago, Ill.
Traylor Eng. & Mfg. Co., Allentown, Penna.

SEARCHLIGHTS
General Electric Co., Schenectady, N. Y.

SHARPENERS, DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

SHOVELS
Wood Shovel & Tool Co., Piqua, O.

SINKERS, ROCK DRILL
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

SKIPS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

SMELTERS
Irvington Smelting & Refining Works, Irvington, N. J.

"SOLIDCAR" SELF-DUMPING CAGES
Car-Dumper & Equipment Co., Chicago, Ill.

SPLICE, CABLE
American Mine Door Co., Canton, Ohio.
Ohio Brass Co., Mansfield, Ohio.

SPLICE, INSULATOR
American Mine Door Co., Canton, Ohio.

SPLICE, TROLLEY WIRE
American Mine Door Co., Canton, Cincinnati, Ohio.
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, N. Y.

STANDARD HOISTING CABLES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

STEAM REDUCING VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

STEAM TRAPS
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

STEEL, HOLLOW & SOLID DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

STEEL, REINFORCING
American Mine Door Co., Canton, Ohio.

STOP AND CHECK VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

STOPERS, ROCK DRILL
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

STORAGE BATTERIES, LOCOMOTIVES
General Electric Co., Schenectady, N. Y.
Ironton Engine Company, Ironton, Ohio.

STRAINER
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

SUSPENSION BRIDGE CABLES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

SWITCHBOARDS, POWER
General Electric Co., Schenectady, N. Y.

SWITCHBOARDS, TELEPHONE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SWITCHES (Disconnecting and Electric)
General Electric Co., Schenectady, N. Y.

SWITCHES, FROGS AND CROSSINGS
Central Frog & Switch Co., Cincinnati, Ohio.

SWITCHES AND FROGS, TROLLEY
American Mine Door Co., Canton, Ohio.
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

SWITCHING CABLES
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

THERMOMETERS, ANGLE & STRAIGHT STEM
Taylor Instrument Companies, Rochester, N. Y.

THERMOMETERS, RECORDING & INDEX
Taylor Instrument Companies, Rochester, N. Y.

THROTTLE AND ENGINE STOP VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

TIPPLES
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

TIPPLE DESIGNERS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

TIPPLE EQUIPMENT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

TOOLS
Wood Shovel & Tool Co., Piqua, O.

TRACKS, PORTABLE, RAIL, ETC.
Central Frog & Switch Co., Cincinnati, Ohio.
West Virginia Rail Co., Huntington, W. Va.

TRAMWAYS
A. Leschen & Sons Rope Co., St. Louis, Mo.

TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

TRANSMISSION ROPE
Williamsport Wire Rope Co., 1301 Peoples Gas Bldg., Chicago, Ill.

TRANSMISSION, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

TRAPS
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

TRIMMINGS, ENGINE
The Lunkenheimer Co., Cincinnati, Ohio.

TRIPLE ACTING NON-RETURN VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

TROLLEY FROGS
Central Frog & Switch Co., Johnstown, Pa.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY (Hangers and Clamps)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY MATERIAL, OVERHEAD
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY WHEELS AND HARPS
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY WIRE
Anaconda Copper Mining Co., Rolling Mills Dept., 111 W. Washington St., Chicago, Ill.

TRUCKS FOR MINE CARS
J. R. Fleming & Son Co., Inc., Scranton, Pa.

TURBINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

VALVES
The Lunkenheimer Co., Cincinnati, Ohio.
Ohio Brass Co., Mansfield, Ohio.

VALVES, AUTOMATIC
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

WAGON LOADERS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

WASHERIES
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

WATER REGULATING VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

WATER RELIEF VALVE
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

WATER SOFTENING AND PURIFYING APPARATUS
Wm. B. Scaife & Sons Co., Oakmont, Pa.

WELDING APPARATUS, ELECTRIC ARC
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

WHISTLES
The Lunkenheimer Co., Cincinnati, Ohio.

WIRE AND CABLE
American Steel & Wire Co., Chicago and New York.
Anaconda Copper Mining Co., Rolling Mills Dept., 111 W. Washington St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Roebling Sons, The John A., Trenton, N. J.
Williamsport Wire Rope Co., Gen. Sale Office, 1301 Peoples Gas Bldg., Chicago, Ill.

WIRE ROPE
A. Leschen & Sons Rope Co., St. Louis, Mo.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples Gas Bldg., Chicago, Ill.

WIRE ROPE FITTINGS
American Steel & Wire Co., Chicago and New York.
Williamsport Wire Rope Co., Gen. Sales Office, 1301 Peoples Gas Bldg., Chicago, Ill.

ZINC ORES
American Zinc, Lead & Smelting Co., 1012 Pierce Bldg., St. Louis, Mo.

80% Ferro-Manganese

18 to 22% Spiegeleisen

Foundry Pig Iron

AMERICAN MANGANESE
MANUFACTURING COMPANY

OFFICES
Bullitt Building, Philadelphia

Plant, including Coal Mines, By-Product Coke Ovens, and Blast Furnaces
Dunbar, Pa.

Pittsburgh Sales Office
OLIVER BUILDING, PITTSBURGH, PA.

The Graphite Corporation

Producers of
GRAPHITE

932 First Wisconsin National Bank Bldg.
MILWAUKEE, WISCONSIN

The Stewart Furnace Company

Successor to
STEWART IRON COMPANY, Ltd.

Manufacturers of
Low Phosphorus and Bessemer
PIG IRON

Cleveland, Ohio
Furnace at Sharon, Pennsylvania

COATES & TWEED

MINERS AND SHIPPERS OF

Lake Superior Iron Ores

卐

Operating Mines in

Michigan and Minnesota

卐

—Offices—

Duluth, Minn. **Virginia, Minn.**

PENNSYLVANIA SMELTING CO.
PITTSBURGH, PA.

Manufacturers of

ASSAYERS' C. P. LITHARGE AND TEST LEAD

OFFICE: PITTSBURGH, PA. WORKS: CARNEGIE, PA.

Phelps Dodge Corporation
99 JOHN STREET - - NEW YORK

Copper

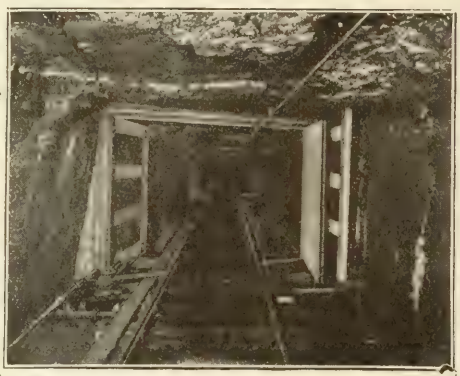
"C ★ Q" Electrolytic

"P. D. Co." Casting

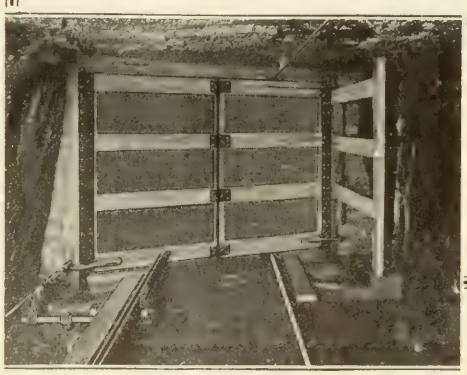
SURE TO OPEN

CANTON AUTOMATIC MINE DOORS

Safeguard Life—Positive in Operation—Open and Close Quickly—Simple in Construction—Built for Service—Prevent Explosions—Conserve Air.



NO INVESTMENT REQUIRED
ABSOLUTELY NONE
ASK US HOW WE DO IT



4000 IN USE
Can be Leased or Bought.
Rental price per month saved in a few days. Purchase price saved in a few months.
Write for Catalog
American Mine Door Co.
916 Robin St.
Canton, Ohio

SURE TO CLOSE

LITTLE HATCHET
Mining Company
Inc.

Developing its
Large Copper Properties,
situate in Hidalgo Co., New Mexico

EXECUTIVE OFFICE: AT THE MINES
POST OFFICE: HACHITA, N. M.

Wilmot Engineering Company
Hazleton, Pennsylvania

Manufacturers of

Improved Breaker Machinery for Conveying, Crushing, Sizing and Cleaning Anthracite Coal

Robert W. Hunt Jno. J. Cone
D. W. McNaugher

ROBERT W. HUNT & CO.
Engineers

Bureau of Inspection, Tests and Consultation

2200 Insurance Exchange
Chicago

Mining Engineers and Chemists
Inspection Construction Materials and Machinery at Point of Manufacture

Premium Coal

Highest Quality Bituminous

Mined from one of the richest bituminous deposits in the Central West, perfectly prepared in all standard sizes by modern machinery and methods. Unusually satisfactory for steam and domestic use because of its uniform quality and high heating power. Premium coal is low in sulphur content and burns cleanly, leaving but little ash. This analysis tells the story:

CERTIFIED ANALYSIS OF PREMIUM COAL —STRAIGHT RUN OF MINE

Ash	9.76
Volatile	33.55
Carbon	56.69
	100.00
Sulphur	2.32
B. T. U. per lb.	13959

Premium coal is especially desirable for steam plant use, where economy and efficiency are so essential. For in Premium Coal, you are sure of the greatest number of heating units **per dollar expended.** Ample service facilities—our mines in Saline County, Illinois, producing 10,000 tons daily, are served by the Illinois Central, Louisville & Nashville and Big Four Railroads.

BIG CREEK COALS, INC.

OMAHA, NEB.
Omaha Nat. Bk. Bldg.

Peoples Gas Building
CHICAGO

MINNEAPOLIS
Andrus Building

Good Management

There are no dark secrets or mysterious methods by which Peabody Management adds to the profits of coal properties.

The results accomplished are due to common-sense business methods; wise handling of funds both in saving and spending; tested systems of development that promote future economical operation; comprehensive knowledge of the most efficient mining methods acquired through long and varied experience; and above all a vigorous, aggressive, seasoned organization functioning smoothly under intelligent and capable direction.

Proof of the value of Peabody Mine Management is found in its steadily growing clientel.

Descriptive Booklet Mailed on Request

PEABODY
COAL COMPANY
Founded 1883

332 So. Michigan Ave. CHICAGO

Operating 44 Mines with Annual Capacity of 23,000,000 Tons

Nothing Better in the Western Field for Every Stove Need and All Steam Demands

Old Ben
Franklin County
COAL

Produced and Shipped by **OLD BEN COAL CORPORATION,** *Minneapolis-Chicago-Omaha*

Mt. Olive and Staunton Coal Company

IIIIII

Mines 1 and 2

STAUNTON, ILL.

Capacity 5,000 Tons Daily

IIIIII

1012 Federal Reserve Bank Building

ST. LOUIS, MISSOURI

NASON
COAL COMPANY
Old Colony Building, CHICAGO

EMPIRE COAL

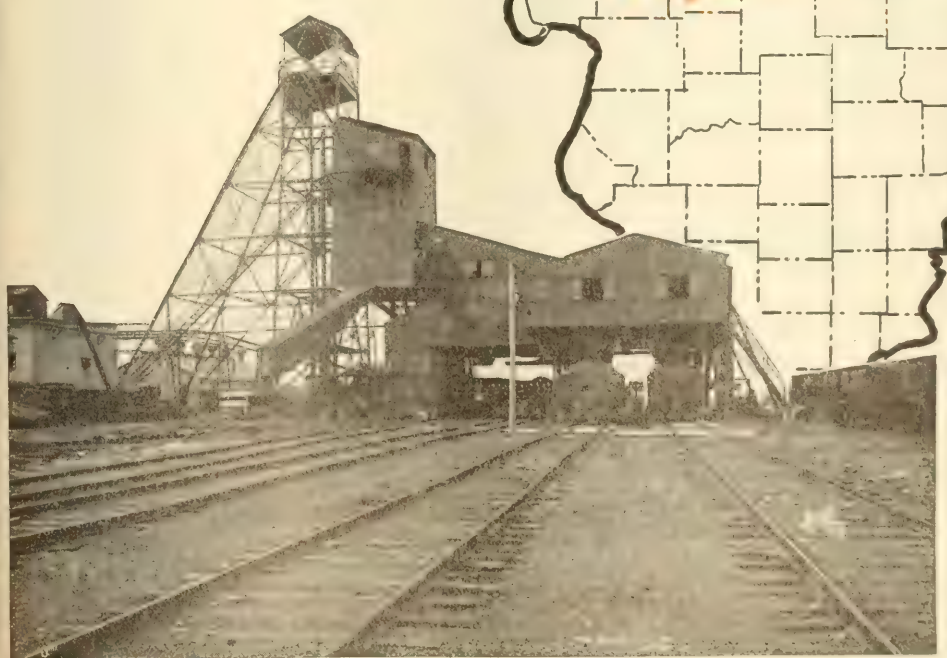
We Mine and Sell

RELIANCE COAL

Illinois
Fifth and
Sixth
Vein
Bituminous
Coal

MINES AT

- **Springfield**
- **Auburn**
- **Virden**
- **Girard**
- **Nokomis**



MINES ON

Chicago, Burlington & Quincy
Chicago & Northwestern
Big Four
Chicago & Alton
Chicago & Eastern Illinois
Chicago, Peoria & St. Louis

WILLIAMS & PETERS

1 Broadway, New York

PENNSYLVANIA COAL COMPANY

PITTSTON COAL

ANTHRACITE = BITUMINOUS

Branch Offices

E. O. SCHERMERHORN
Eastern Sales Agent
141 Milk Street, Boston, Mass.

W. T. ROBERTS
Western Sales Agent
1112 Prudential Building,
Buffalo, N. Y.

F. N. PEASE,
Southwestern Sales Agent
203 S. Dearborn Street, Chicago, Ill.

THE PHILADELPHIA & READING COAL & IRON COMPANY

Miners and Shippers of

FAMOUS READING ANTHRACITE

Hard White Ash	Shamokin	Lykens Valley
Free Burning White Ash	Red Ash	North Franklin
		Lorberry

NO SMOKE

BOSTON—Thos. M. Richards, Gen'l Eastern Agent, 141 Milk St.
NEW YORK—Frank Oberrender, Sales Agent, 143 Liberty St.
PHILADELPHIA { Geo. C. Coughlin, City and Southern Sales Agt.
Reading Terminal { Warren B. Smith, Line Sales Agent.
READING—J. H. Wily, Agent, Second National Bank Building.
BALTIMORE—T. W. Claggett, Agent, Calvert Building.
WASHINGTON—J. A. Lounsbury, Agent, 308 Ouray Bldg.
ROCHESTER—L. Treman, General Northern Sales Agent. (Western New York and Canada.)
BUFFALO—W. A. Reed, Sales Agent, Prudential Building.
DETROIT—C. D. Huff, Majestic Bldg.
CHICAGO—J. H. M. Claggett, Resident Manager, Old Colony Bldg.
MILWAUKEE—D. H. Kirkpatrick, Sales Agent, 704 Majestic Bldg.
ST. PAUL—Louis Zschau, Agent, 341 Como Ave.
MINNEAPOLIS—E. T. McDonald, N. W. Sales Agent, Lumber Exchange Bldg.

Robert J. Montgomery,
Vice-President and General Sales Agent

GENERAL OFFICES
READING TERMINAL, PHILADELPHIA, PA.

PEABODY FUEL COMPANY
CONNELLSVILLE
COKE
OPERATORS & SHIPPERS
COAL
COKING-GAS-STEAM
PITTSBURGH, PA.

THE UNITED STATES COAL CO.

Miners and Shippers of

CROW HOLLOW COAL

Shipments via Pennsylvania Lines, New York Central and Wheeling and Lake Erie Railways

Crow Hollow Coal

is Mined in Jefferson County, Ohio

General Offices

1206 Citizens Building, Cleveland

RUTLEDGE & TAYLOR COAL COMPANY

Exclusive Distributors of

"Livingston Coal"
Produced by
The New Staunton Coal Co.
Livingston, Ill.

"Security Coal"
Produced by
Security Coal & Mining Co.
Du Quoin, Ill.

"Rock Spring Coal"
Produced by
Rock Spring Fuel Co.
Rock Springs, Wyo.

General Offices—FISCHER BUILDING, CHICAGO
Branch Offices—OMAHA, NEBR., ST. LOUIS, MO.

Miners and Shippers

Stonega Coal

A High-Grade Steam and By-Product Coal—low in sulphur and ash

Roda Coal

Unexcelled for the manufacture of Gas and By-Product purposes

Stonega Coke

A Superior Foundry and Furnace Coke

Roda Coke

In extensive use for Water Gas manufacture and Metallurgical purposes. Low in Sulphur, Ash and Phosphorus

---

BUNKER COAL

SUPPLIED AT

Charleston, S. C.—Savannah, Ga.—Jacksonville, Fla.

EXPORT and COASTWISE COAL

LOADED AT

Charleston, S. C.—Norfolk, Va.

STONEGA COKE & COAL COMPANY, Inc.

SPARTANBURG, S. C.
NEW YORK

BIG STONE GAP, VA.
PHILADELPHIA, PA.

CHARLESTON, S. C.
NORFOLK, VA.

THE LEHIGH COAL AND NAVIGATION COMPANY

Miners and Shippers

1820

OLD COMPANY'S LEHIGH

REG. U.S. PAT. OFF.

For Over A Century

1922

ANTHRACITE

"The Best Since 1820"

BRANCH OFFICES

NEW YORK BOSTON

SPRINGFIELD BUFFALO

COAL CLINCHFIELD SERVICE TRADE MARK

MINED BY

CLINCHFIELD COAL CORPORATION

VIRGINIA

"CLINCHFIELD"

"THE STANDARD OF THE SOUTHEAST"

SOLD BY

CLINCHFIELD FUEL COMPANY

SPARTANBURG, S. C.—24 BROAD ST., NEW YORK

COAL CLINCHFIELD SERVICE TRADE MARK

COAL CLINCHFIELD SERVICE TRADE MARK

Lehigh & Wilkes-Barre Coal Company

Miners and Shippers of

Anthracite Coal

Honey Brook Lehigh

Wilkes-Barre Free Burning

Plymouth Red Ash

The Sign of Quality

ALL RAIL AND TIDEWATER SHIPMENTS

Shipping Wharf, Pier 18, Jersey City

DANIEL ANTHONY, Vice President and General Agent

H. F. WILSON, Ass't General Agent
143 Liberty Street, New York

A. W. ROBERTSON, Line Agent
Elizabeth, New Jersey

LEHIGH & WILKES-BARRE COAL COMPANY OF NEW JERSEY
A. DENITHORNE, President
48 Congress St., Newark, N. J.

LEHIGH & WILKES-BARRE COAL COMPANY OF MASSACHUSETTS
W. A. Staples, General Manager
141 Milk Street, Boston, Mass.

General Offices: 16 South River Street, WILKES-BARRE, PA.

The Lehigh Valley Coal Company

COXE BROTHERS & COMPANY, INCORPORATED

Miners and Shippers of

ANTHRACITE COAL

Operations located in Counties of

LACKAWANNA,
LUZERNE,
CARBON,
SCHUYLKILL,
COLUMBIA,
NORTHUMBERLAND,
PENNSYLVANIA.

General Office: 133 North River St., WILKES-BARRE, PA.

J. K. Dering Coal Company

Miner and Shipper of

BITUMINOUS COAL

IN DOMESTIC AND STEAM SIZES FROM THE INDIANA & ILLINOIS FIELDS

1914-20 McCormick Building, Chicago

COAL -:- COKE

FORTY years of constantly doing our best in supplying dependable products, *when needed*, has resulted in very satisfactory relations between this company and many western mine operators.

The Colorado Fuel and Iron Company

General Offices
BOSTON BLDG.,
DENVER, COLORADO

Rails and Fastenings, Steel Bars and Angles, Nails, Wire, Etc.

President
HUGH SHIRKIE

Vice-President
STEWARD SHIRKIE

Secretary
HENRY ADAMSON

Treasurer
STEWARD SHIRKIE

SHIRKIE COAL COMPANY

TERRE HAUTE, INDIANA

Miners and Shippers of

INDIANA BITUMINOUS

No. 3 and No. 5 Coal

Mines Located on C. T. H. & S. E. R. R.

MIAMI COAL COMPANY

McCORMICK BUILDING, CHICAGO

J. T. CONNERY, President
J. P. CONNERY, Secretary

MINERS OF INDIANA BITUMINOUS COAL

MINES AT CLINTON AND BLACK HAWK, INDIANA

CAPACITY

7,500 tons per day 5th Vein
5,000 tons per day 4th Vein

SHOAL CREEK COAL COMPANY

WRIGLEY BUILDING
CHICAGO

PRODUCERS AND DISTRIBUTORS OF

PANAMA COAL

The J. P. Burton Coal Company

Successors to

The Burton Beidler & Phillips Co.---Ridgway Burton Co.

ANTHRACITE
Sales Agents For

Legitt's Creek Anthracite Co.
Scranton Anthracite

The Trevorton Colliery Co.
Lykens Valley Anthracite

Thouron Coal Company
Pottsville Anthracite

PRODUCERS AND SHIPPERS OF

Coal and Coke

825 NATIONAL CITY BANK BUILDING

CLEVELAND, OHIO

BITUMINOUS
Sales Agents For

Kennon Coal & Mining Co.
Pittsburgh No. 8

Kanawha-Elkhorn Collieries,
Big Vein Elkhorn
Kanawha Splint Gas

Millers Creek
Domestic Lump

Kentucky and West Virginia Coal

Ohio Coal :-: New River
Gas Coal :-: Pocahontas

Compliments of

Maher Collieries Company

KIRBY BUILDING,
CLEVELAND, OHIO

THE PITTSBURGH & OHIO MINING COMPANY

Shippers of

West Va. and Kentucky Splint and Gas Coals
D. L. & W.—SCRANTON ANTHRACITE—D. & H.
Connellsville Foundry Coke

Famous "Pan Handle" Block
Specially Prepared for Steam and Domestic Use

Pittsburgh Vein of Belmont County, Ohio
Unexcelled as a Steam Producer and Domestic Fuel

General Offices: Kirby Building, CLEVELAND; DETROIT, MICH.; BUFFALO, N.Y.

HARRISBURG
A SALINE COUNTY COAL

O'Gara Harrisburg—

The preferred coal of the central west.
Its heat content gives it power.
Its preparation gives it uniformity.
Its producers give it service.

O'Gara Coal Company

518 McKnight Bldg.
Minneapolis, Minn.

Fisher Bldg.
Chicago, Ill.

414 Putnam Bldg.
Davenport, Iowa

From Mine to Market

IN PRESENTING our compliments and all good wishes to all of those active in or connected with The American Mining Congress Convention, we do so from the perspective of fifty-three years of mining Bituminous Coal.

It is a pleasure to welcome you to Cleveland and we desire to make such a good impression upon all of you that you will want to come again.

Sincerely yours,

W. H. Warner & Company
CLEVELAND, OHIO

Rail & River Coal Company

Mines in Belmont County, Ohio

General Offices
744 Kirby Building
Cleveland, Ohio

THE CAMBRIDGE COLLIERIES CO.

PRODUCERS OF

Cambridge

AND

Pittsburgh Number Eight Vein Coal

PRINCIPAL OFFICE

KIRBY BUILDING, CLEVELAND

The Youghiogheny & Ohio Coal Co.

Hanna Building, Cleveland, Ohio

MINERS AND SHIPPERS

Youghiogheny and Westmoreland Gas
Pittsburgh Steam, Pittsburgh No. 8
Bergholz-Amsterdam Coals

Branch Offices

COLBY-ABBOTT BLDG. - MILWAUKEE, WIS.
HOUSE BLDG. - - - - - - PITTSBURGH, PA.
PRUDENTIAL BLDG. - - - BUFFALO, N. Y.

Distributing Docks

SUPERIOR - - - - - - - - - - - WISCONSIN
MILWAUKEE - - - - - - - - - WISCONSIN
PORT ARTHUR - - - - - - - - - - ONTARIO
FORT WILLIAM - - - - - - - - - ONTARIO

Northwestern Sales Agent

NORTHERN COAL & DOCK CO., ST. PAUL, MINN.
D. E. ADAMS COAL CO., WINNIPEG, MANITOBA

CROZER-POCAHONTAS CO.

1503-09 NORTH AMERICAN BUILDING
PHILADELPHIA, U. S. A.

TIDE WATER PIERS
LAMBERTS POINT, VA.
GREAT LAKES

SANDUSKY DOCKS, O.
TOLEDO, O.

TRADE MARK
CROZER

Mines in McDowell Co., W. Va.
On Norfolk & Western Ry.

CROZER COAL & COKE CO.
UPLAND COAL & COKE CO.
POWHATAN COAL & COKE CO.
LYNCHBURG COAL & COKE CO.
EUREKA COAL & COKE CO.
PEERLESS COAL & COKE CO.
PAGE COAL & COKE CO.

SHIPPERS, EXPORTERS AND BUNKER SUPPLIES OF

Standard Pocahontas Coal

OVER 2,000,000 TONS ANNUALLY

CHICAGO 1105 Fisher Bldg. | NORFOLK, VA. Citizens Bank Bldg. | BLUEFIELD, W. VA. Law and Commerce Bldg. | BOSTON 50 Congress St. | LONDON 17 St. Helens Pl.

MADEIRA, HILL & COMPANY

Miners and Shippers

ANTHRACITE *and* BITUMINOUS COAL

PHILADELPHIA -:- NEW YORK

Philadelphia Boston Pittsburgh Buffalo Cincinnati, Ohio Altoona Mauch Chunk Norton, Va.

WHITNEY & KEMMERER

143 Liberty St., New York

MINERS & SHIPPERS

STEAM COAL	GAS COAL	COKE	
Lilly (Smithing)	Westmoreland	Connellsville	Furnace
Somerset	Youghiogheny	Fairmont	Foundry
Clearfield	Fairmont	Latrobe	Crushed
New River	Kanawha	Wise County, Va.	
Pocahontas	Wise County, Va.		

West Virginia Coal & Coke Company's Copen and Hiawatha Gas and Steam

EXCLUSIVE SELLING AGENTS

Rich Hill Coal Co., (Cambria Co., Pa.) Superior Fuel Co., (Bessemer Field)
Wise Coal & Coke Co., (Wise Co., Va.)

Also shippers of following
HIGH-GRADE ANTHRACITE

Alden
Mt. Jessup
Oak Hill
Sandy Run
Scranton
Langcliffe

KINGSTON COAL CO'S
Kingston

LEHIGH & WILKES-BARRE COAL CO'S
Honey Brook, Wilkes-Barre, Plymouth

PHILADELPHIA & READING COAL & IRON CO'S
Reading Coals

Shipments to all points—Tidewater, Lake or all Rail

General Offices
Harrison Building
Philadelphia

WM. J. FAUX, *President*

New York Office
253 Broadway

Logan Coal Company

PHILADELPHIA

MINERS AND SHIPPERS

FAUX-LOGAN PREPARED SMITHING COAL has a national reputation as the best blacksmithing coal obtainable.

LOGAN BITUMINOUS STEAMING COAL. Recognized as being equal and superior to the best grades of New River and Pocahontas.

Collieries at

DUNLO, BEAVERDALE, LLOYDELL and RUTHFORD,
CAMBRIA COUNTY, PA.

Consolidated Coal Company
of St. Louis

10 Mines *6 Washers*

DAILY CAPACITY
Mines . . . 30,000 Tons
Washers . . 6,000 Tons

9 Railroads

Old Colony Building
CHICAGO

Railway Exchange Building
ST. LOUIS

Genuine Fourth Vein Coal

ESTABLISHED 1875

COAL BLUFF MINING CO.

Genuine Brazil Block Coal

TERRE HAUTE, INDIANA

Genuine Fourth Vein Shaker Screened Coal

DOMESTIC LUMP
5-inch Boom Loaded

3 x 5 EGG
Shaker Screened

1¼ x 3 NUT
Shaker Screened

HIGHEST QUALITY COAL
FROM OUR WABASH MINE

BUY THE BEST WRITE FOR PRICES

Coal Bluff Mining Company

TERRE HAUTE, IND.

Genuine Brazil Block Coal

Genuine Fourth Vein Coal

SAM'L A. TAYLOR, C. E.

Member A. S. C. E.
and A. I. M. E.

Consulting
Civil and
Mining Engineer

Reports on
Coal Mines and Properties
a Specialty

Cabl Address: Rolyat *Phone:* 2480 Court
712 FIRST NATIONAL BANK BLDG.
PITTSBURGH, PA.

St. Louis and O'Fallon Coal Company

St. Louis, Mo.

PRODUCERS OF
STANDARD COAL

Capacity of Mines
5000 TONS DAILY

THOMAS M. JENKINS, *President*
ADOLPHUS BUSCH, III, *Vice-Pres.*
GEO. E. KAUFFMANN, *Secy-Treas.*

Peerless Coal Company

McCORMICK BLDG.
CHICAGO

Producers of
SPRINGFIELD (Ill.)
COAL

SMALL SIZES RESCREENED
CORRESPONDENCE SOLICITED

FORD COLLIERIES COMPANY

Producers

DEER CREEK COAL

CURTISVILLE, PA.
B. & L. E. R. R.

Main Office
DETROIT, MICH.

THORNE, NEALE & COMPANY., Inc.

FRANKLIN BANK BUILDING
1416 CHESTNUT STREET—9 A. M. to 4 P. M.
PHILADELPHIA, PA.

MINERS' AGENTS AND WHOLESALE DEALERS

Anthracite **COAL** ***Bituminous***

ANTHRACITE COLLIERIES

Mt. Lookout	Harry E	Forty Fort	New Castle	Locust Run (Washery)
Sterrick Creek	Northwest	Lackawanna	Buck Run	

Pardee Bros. & Co.—Lattimer Lehigh

BITUMINOUS

Sonman, South Fork District—Low volatile, low ash, low sulphur

Smithing—1 1-4 in. screened

Fairmont — Quemahoning — Indiana County

NEW YORK OFFICE: 17 BATTERY PLACE

Branch Offices: Baltimore Buffalo Chicago Scranton, Pa. Mauch Chunk, Pa.

THE LEHIGH COAL AND NAVIGATION COMPANY

Miners and Shippers

OLD COMPANY'S LEHIGH
REG. U. S. PATENT OFFICE

For Over a Century

1820 **ANTHRACITE** **1922**

"The Best Since 1820"

437 CHESTNUT STREET - PHILADELPHIA, PENNSYLVANIA

American Mining Congress

OFFICERS AND COMMITTEES, 1922

OFFICERS

W. J. Loring, President.
Daniel B. Wentz, First Vice-President.
E. L. Doheny, Second Vice-President.
Thomas T. Brewster, Third Vice-President.
J. F. Callbreath, Secretary.

DIVISION STAFF

E. C. Porter, Convention Manager.
George H. Bailey, Counsel.
H. W. Smith, Chief Mineral Tariffs Division.
M. W. Kriegh, Tax Division.
E. H. Pullman, Chief Publicity Department.
Ira L. Smith, Editor, Mining Congress Journal.
E. R. Coombes, Asst. to Secretary.

DIRECTORS

W. J. Loring, San Francisco, Calif.
Bulkeley Wells, Denver, Colo.
Daniel B. Wentz, Philadelphia, Pa.
John C. Howard, Salt Lake City, Utah.
Thomas T. Brewster, St. Louis, Mo.
Carl Scholz, Charleston, W. Va.
H. W. Seaman, Chicago, Ill.
E. L. Doheny, Los Angeles, Calif.
Sidney J. Jennings, New York.
Hugh Shirkie, Terre Haute, Ind.
Robert Linton, New York City.
James S. Douglas, Douglas, Ariz.

EXECUTIVE COMMITTEE

W. J. Loring — Robert Linton
Sidney J. Jennings, New York.

COMMITTEES

COOPERATION

AMERICAN MINING CONGRESS AND AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

A. M. C.

Henry Mace Payne, Machinery Club, New York City.
A. Cressy Morrison, 42d St. Bldg., New York City.
J. E. Spurr, Hill Bldg., New York City.
W. R. Ingalls, 115 Broadway, New York City.
J. R. Finlay, Room 802, 45 Cedar St., New York City.
Daniel B. Wentz, Land Title Bldg., Philadelphia, Pa.

A. I. M. & M. E.

E. P. Mathewson, 42 Broadway, New York City.
W. L. Saunders, 11 Broadway, New York City.
Walter Douglas, 99 John St., New York City.
Benjamin B. Thayer, 42 Broadway, New York City.
Edwin Ludlow, 149 Broadway, New York City.
Samuel Taylor, Second National Bank Bldg., Pittsburgh, Pa.

ALASKAN AFFAIRS

John A. Davis, Fairbanks, Alaska.
Falcon Joslin, 2203 L. C. Smith Bldg., Seattle, Wash.
Bart L. Thane, 408 Crocker Bldg., San Francisco, Calif.

MINING IN FOREIGN COUNTRIES

J. E. Spurr, *Chairman*, Hill Bldg., New York City.
Van H. Manning, 15 West 44th St., New York City.
E. L. Doheny, Security Bldg., Los Angeles, Calif.
W. J. Loring, Crocker Bldg., San Francisco, Calif.
Matthew C. Fleming, New York City.
H. Foster Bain, Bureau of Mines, Wash., D. C.

ADVISORY COMMITTEE UNITED STATES BUREAU OF MINES AND GEOLOGICAL SURVEY

Bulkeley Wells, *Chairman*, Denver, Colo.
Walter Douglas, New York City.
Rembrandt Peale, New York City.
H. Foster Bain, U. S. Bureau of Mines, Washington, D. C.
George Otis Smith, U. S. Geological Survey, Washington, D. C.

DEPARTMENT OF MINES AND MINING

W. J. Loring, *Chairman*, San Francisco, Calif.
Walter Douglas, New York City
Bulkeley Wells, Denver, Colo.
George H. Crosby, Duluth, Minn.
D. C. Jackling, Hobart Bldg., San Francisco, Calif.
Carl Scholz, Charleston, W. Va.
S. D. Warriner, Philadelphia, Pa.

COOPERATION (INTERNAL REVENUE DEPARTMENT)

J. F. Callbreath, American Mining Congress, Munsey Bldg, Washington, D. C.
John T. Barnett, 1024 Lafayette St., Denver, Colo.
Paul Armitage, 2174, 233 Broadway, New York City
L. C. Boyle, Kansas City, Mo.
Rush C. Butler, Chicago, Ill.

COAL EXPORTS

Dr. Henry Mace Payne, Machinery Club, New York City
Geo. S. Rice, Bureau of Mines, Washington, D. C.
John Callahan, Woodward Bldg., Washington, D. C.
Chas. A. Owen, Pres., Imperial Coal Corporation, 17 Battery Pl., New York City
G. A. O'Reilly, Irving National Bank, New York City

FEDERAL TAXATION

Paul Armitage, *Chairman*
233 Broadway, New York, N. Y.

Geo. E. Holmes, *Vice-Chairman*
15 William St., New York, N. Y.

R. C. Allen, Hanna Building, Cleveland, Ohio.
A. Scott Thompson, Miami, Okla.
Wm. B. Gower, 20 Exchange Place, New York, N. Y.
John C. Howard, Utah Oil Refining Co., Salt Lake City, Utah
R. V. Norris, 520 Second National Bank Bldg., Wilkes-Barre, Pa.
J. C. Dick, 1502 Walker Bank Bldg., Salt Lake City, Utah.
A. P. Ramstedt, Wallace, Idaho
E. L. Doheny, Security Bldg., Los Angeles, Cal.
Robt. N. Miller, Southern Building, Washington, D. C.

UNIFORM COAL MINE REPORTS

S. A. Taylor, Second National Bank Bldg., Pittsburgh, Pa.
Carl Scholz, Professional Building, Charleston, W. Va.
A. H. Land, Huntington, W. Va.
Morton L. Gould, 701 Terminal Bldg., Indianapolis, Ind.
G. H. Caperton, Box 601, Charleston, W. Va.
Thomas T. Brewster, St. Louis, Mo.

OPERATORS' CO OPERATING COMMITTEE

PETROLEUM

J. G. Bradley, *Chairman*
J. F. Callbreath, *Secretary*

E. L. Doheny, Mexican Petroleum Co., Security Bldg., Los Angeles, Calif.
George S. Davidson, Gulf Refining Co., Pittsburgh, Pa.
A. L. Beaty, Texas Co., 17 Battery Pl., New York City.
H. F. Sinclair, Sinclair Oil Co., 45 Nassau St., New York City.
Walter Teagle, Standard Oil Co. of N. J., New York City.

METALS

Bulkeley Wells, 201 14th St., Denver, Colo., Gold.
F. B. Richards, Leader-News Bldg., Cleveland, O., Iron.
Edgar Z. Wallower, Joplin, Mo., Zinc.
B. B. Thayer, 25 Broadway, New York City, Copper.

COAL

J. G. Bradley, Elk River Coal & Lumber Co., Dundon, W. Va.
T. H. Watkins, Pennsylvania Coal & Coke Corp., New York City
E. W. Parker, Anthracite Bureau of Information, Philadelphia, Pa.
Albert Nason, Nason Coal Co., Chicago, Ill.
J. G. Puterbaugh, McAlester Fuel Co., McAlester, Okla.
S. D. Warriner, Lehigh Coal & Navigation Co., Philadelphia, Pa.

STANDARDIZATION DIVISION
Metal and Coal Branches

COAL MINING BRANCH

General Committee

Colonel Warren R. Roberts, *Chairman*, 1110 Wrigley Bldg., Chicago, Ill.
E. D. Knight, 1208 Kanawha St., Charleston, W. Va.
C. E. Watts, Efficiency Engineer, Berwind-White Coal Mining Company, Windber, Pa.
A. B. Kiser, Electrical Engineer, Pittsburgh Coal Co., Pittsburgh, Pa.
C. H Trik, Jeffrey Manufacturing Co., Columbus, Ohio.
K. A. Pauly, Power & Mining Engineering Dept., General Electric Co., Schenectady, N. Y.
E. N. Zern, Keystone Cons. Publishing Co., 711 Penn Ave., Pittsburgh, Pa.
Dr. Henry Mace Payne, Machinery Club, New York City
R. L. Adams, Chief Engr., Old Ben Coal Corp., Christopher, Ill

Underground Transportation

C. E. Watts, *Chairman*

Charles M. Means, Consulting Engineering, Pittsburgh, Pa.
Graham Bright, Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.
Joseph Bryan, General Electric Co., Pittsburgh, Pa.
F. C. Coseo, Jeffrey Manufacturing Co., Columbus, Ohio
D. F. Lepley, General Manager, Connellsville Manufacturing & Supply Co., Connellsville, Pa.
E. A. Watters, General Supt., Hicks' Coal Companies, Leechburg, Pa.
J. Milliken, care Pittsburgh Testing Laboratory, P. O. Box 1115, Pittsburgh, Pa.
A. H. Eble, General Sales Manager, Baldwin Locomotive Works, Philadelphia, Pa.
H. K. Porter, Mine Car Department, Hyatt Roller Bearing Co., New York City
Frank S. Barks, President, Lincoln Steel & Forge Co., St. Louis, Mo.
Fred Norman, Chief Engineer, Allegheny River Mining Co., Kittanning, Pa.
T. A. Parker, Manager, Mine Car & Equipment Dept., St. Louis Structural Steel Co., St. Louis, Mo.
W. J. Fene, U. S. Bureau of Mines, Pittsburgh, Penna.

Mining and Loading Equipment

E. N. Zern, *Chairman*

D. J. Carroll, Chicago, Wilmington & Franklin Coal Co., Benton, Ill.
Carl Scholz, General Manager, Raleigh-Wyoming Coal Co., Charleston, W. Va.
N. D. Levin, Jeffrey Manufacturing Co., Columbus, Ohio
J. M. Clark, Clark & Krebs, Charleston, W. Va.
M. Mitchell, Sullivan Machinery Co., St. Louis, Mo.
William Whaley, Myers-Whaley Co., Knoxville, Tenn.
E. S. McKinley, 625 Denham Bldg., Denver, Colo.
Wm. E. Hamilton, 310 Schultz Bldg., Columbus, Ohio
Walter Stevens, Valier Coal Co., Valier, Ill.
S. W. Farnham, Mining Engineer, Goodman Mfg. Co., Chicago, Ill.
E. K. Bowers, Morgan-Gardner Electric Co., 2640 Shields Avenue, Chicago, Ill.
J. G. Smyth, Cons. Coal Co., Jenkins, Ky.
Edw. H. Coxe, Snowdon Coke Co., Brownsville, Pa.
Newell G. Alford, Union Arcade Bldg., Pittsburgh, Pa.

Drainage

E. D. Knight, *Chairman*

M. C. Benedict, Consulting Engineer, Johnstown, Pa.
E. F. Austin, Manager, Mine Pump Dept., Dravo-Doyle Co., Pittsburgh, Pa.
Cecil W. Smith, Mining Engr., Nokomis Coal Co., Old Colony Building, Chicago, Ill.
F. W. Smith, Mine Drainage Engr., Weinman Pump & Supply Co., Pittsburgh, Pa.
F. J. Emeny, Chief Engr., The Deming Company, Salem, Ohio
Professor John W. Hallock, Head of Dept. of Industrial Engineering, University of Pittsburgh, Pittsburgh, Pa.
R. Y. Wert, Mine Drainage Supt., Durham Coal & Iron Co., Soddy, Tenn.
J. H. Edwards, Electric Engr., Elkhorn Piney Coal Mining Co., Huntington, W. Va.
L. D. Tracy, Mining Engineer, U. S. Bureau of Mines, Pittsburgh, Pa.
Walter D. Stockley, 77 Union Arcade Bldg., Pittsburgh, Pa.
M. Spillman, Worthington Pump & Machinery Corp., Harrison, N. J.
Roscoe N. Woltz, Electrical Engr., Stonega Coal & Coke Co., Big Stone Gap, Va.
Henry E. Cole, Harris Pump & Supply Co., 320 Second Ave., Pittsburgh, Pa.
Chas. H. Matthews, care M. A. Hanna & Co., Cleveland, Ohio

Ventilation

C. H. Trik, *Chairman*

J. H. Doughty, Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre, Pa.
Howard N. Eavenson, Mining Engr., Union Arcade Bldg., Pittsburgh, Pa.
J. C. Gaskill, Consolidation Coal Co., Fairmont, W. Va.
Martin J. Lide, Birmingham, Ala.
G. E. Lyman, Gen'l Supt., Madison Coal Corporation, Glen Carbon, Ill.
C. E. Sharpless, Engineer, Ebensburg Coal Co., Ebensburg, Pa.
E. B. Wagner, Lehigh Valley Coal Co., Wilkes-Barre, Pa.
H. Bert Wright, Pocahontas Fuel Co., Pocahontas, Va.
E. N. Zern, Keystone Cons. Publishing Co., Pittsburgh, Pa.
W. J. Montgomery, Jeffrey Mfg. Co., Columbus, O.

Outside Coal Handling Equipment

Henry Mace Payne, *Chairman*

F. W. Whiteside, Chief Engineer, Victor American Fuel Co., Denver, Colo.

W. S. Bogle & Co.

Incorporated

Producers and Distributors

of

ST. BERNICE & ESSANBEE COALS

Mines on
C. M. & St. P. Ry. Co.
Blanford, Indiana

Principal Office
25 N. Dearborn St.
Chicago, Ill.

HIGH GRADE

CATALOGUES

AND

ADVERTISING

WHILE attending the Mining Congress at the Cleveland Auditorium, pay us a visit and see the finest printing plant in the central west. We are located next door to the auditorium. The character of our equipment makes our resourcefulness in emergencies unequalled.

The A. S. Gilman Printing Co.
623-637 East St. Clair Avenue
Cleveland, Ohio

TWO DOORS EAST OF THE CLEVELAND AUDITORIUM

DICKSON & EDDY

Anthracite & Bituminous

Established 1890

D & E

Executive Offices:
17 Battery Place
New York City

Branch Offices:
Boston - Buffalo

Domestic and Steam Coal for all Purposes

D & E D & E D & E

Anthracite

Scranton Coal Co.

West End Coal Co.

Price Pancoast Coal Co.

DICKSON & EDDY NEW YORK

OFFICERS AND COMMITTEES, 1922—(Continued)

Jas. Needham, General Manager, St. Paul Coal Co., Chicago, Ill.
F. G. Morris, G. S. Coal Mines, Republic Iron & Steel Co., Sayreton, Ala.
M. A. Kendall, Chief Engineer, Stephens-Adamson Mfg. Co., Aurora, Ill.
Warren R. Roberts, Wrigley Building, Chicago, Ill.
Rudolph H. Kudlich, Asst. to Chief Mechanical Engr., U. S. Bureau of Mines, Washington, D. C.
Hubb Bell, Sales Chemist, U. S. Testing Co., 316 Hudson St., New York City

Underground Power Transmission

A. B. Kiser, *Chairman*

Harry M. Warren, Electrical Engineer, D. L. & W. R. R., Scranton, Pa.
W. A. Chandler, care of Hudson Coal Co., Scranton, Pa.
R. L. Kingsland, General Superintendent, P. & M. Dept., Cons. Coal Co., Fairmont, W. Va.
Carl Lee, Electrical Engineer, Peabody Coal Co., McCormick Bldg., Chicago, Ill.
L. C. Ilsley, 4800 Forbes St., Pittsburgh, Pa. (Bureau of Mines.)

Power Equipment

K. A. Pauly, *Chairman*

D. C. McKeeham, Box 913, Union Pacific Coal Co., Rock Springs, Wyo.
G. S. Thompson, Colorado Fuel & Iron Co., Pueblo, Colo.
H. F. Randolph, Cons. Engr., 2330 Oliver Bldg., Pittsburgh, Pa.
M. D. Kirk, Pittsburgh Terminal R. R. Coal Co., Wabash Bldg., Pittsburgh, Pa.
R. W. E. Moore, Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.
R. L. Kingsland, Consolidated Coal Co., Fairmont, W. Va.
W. C. Shunk, Stonega Coal & Coke Co., Big Stone Gap, Va.
J. T. Jennings, Philadelphia & Reading Coal & Iron Co., Pottsville, Pa.
W. C. Adams, with Allen & Garcia, Chicago, Ill.
O. P. Hood, Chief Mechanical Engineer, Bureau of Mines, Washington, D. C.
Graham Bright, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.
A. J. Nicht, Allis-Chalmers, Milwaukee, Wis.
Stephen H. Green, Pacific Coast Coal Co., Seattle, Wash.
Charles Legrand, Phelps Dodge Corp., Douglas, Ariz.
Martin J. Lide, Cons. Engr., Birmingham, Ala.
C. D. Woodward, Chief Electrical Engineer Anaconda Copper Mining Co., Butte, Mont.

Mine Timbers

R. L. Adams, *Chairman*

N. A. Barnhart, Bertha Coal Co., Pittsburgh, Pa.
B. C. Collier, Cement-Gun Co., Allentown, Pa.
Geo. T. Stevens, Clinchfield Coal Corp., Dante, Va.
George M. Hunt, Forest Products Laboratory, Madison, Wis.
D. A. Stout, Mgr., Fuel Dept., Colorado Fuel & Iron Co., Pueblo, Colo.
Chas. N. Perrin, National Hardwood Lumber Ass'n., 1100 Seneca St., Buffalo, N. Y.

Advisory Committee on Safety Codes

S. W. Farnham, Goodman Mfg. Co., Chicago, Ill.—Representing Mining & Loading Equipment
T. A. Parker, St. Louis Structural Steel Company, St. Louis, Mo.—Representing Underground Transportation
L. D. Tracy U. S. Bureau of Mines, Pittsburgh, Pa.—Representing Mine Drainage.
Martin J. Lide, Consulting Engineer, Birmingham, Ala.—Representing Power Equipment
A. B. Kiser, Pittsburgh Coal Co., Pittsburgh, Pa.—Representing Underground Power Transmission

---

METAL MINING BRANCH

General Committee

Charles A. Mitke, Bisbee, Ariz., Chairman
N. B. Braly, General Manager, North Butte Mining Co., 14 W. Granite St., Butte, Mont.
William B. Daly, Asst. General Manager, Anaconda Copper Company, Butte, Mont.
William Conibear, Inspector, Dept. of Safety, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
H. C. Goodrich, 1408 Deseret Bank Bldg., Salt Lake City, Utah
Gerald Sherman, Phelps-Dodge Corp., Douglas, Ariz.
Lucien Eaton, Superintendent, Ishpeming District, Cleveland-Cliffs Iron Company, Ishpeming, Mich.
T. O. McGrath, Shattuck Arizona Mining Co., Bisbee, Ariz.
Forest Rutherford, 120 Broadway, New York City.
Philip Wilson, Calumet & Arizona Mng. Co., Warren, Ariz.

Mine Drainage

(*In process of organization*)

C. Mendelsohn, Master Mechanic, Old Dominion Co., Globe, Ariz.
Wm. H. Gallagher, Jr., Chief Mech. Engr., Pickands Mather & Co., Duluth, Minn.
W. N. Tanner, Mech. Engr., Anaconda Copper Co., Butte, Mont.
O. D. McClure, Cleveland Cliffs Iron Co., Ishpeming, Mich.
G. L. Kollberg, Allis-Chambers Mfg. Co., Milwaukee, Wis.
H. T. Abrams, Ingersoll-Rand Co., New York City.

Drilling Machines and Drill Steel

N. B. Braly, *Chairman*

Arthur B. Foote, North Star Mines, Grass Valley, Calif.
Arthur Notman, Superintendent, Mine Dept., Copper Queen Br., Phelps-Dodge Corp., Bisbee, Ariz.
O. J. Egleston, Manager, U. S. Smelting, Refining & Mining Co., Kennett, Calif.
C. S. Elayer, General Foreman, Arizona Commercial Mining Co., Globe, Ariz.
J. A. Fulton, Idaho-Maryland Mines Co., Grass Valley, Calif.
L. C. Bayles, Chief Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.
H. Seamon, Efficiency Engineer, United Verde Copper Co., Jerome, Ariz.
Ocha Potter, Superintendent, Superior Division, Calumet and Hecla Mining Co., Houghton, Mich.
R. T. Murrill, Inspiration Cons. Copper Co., Inspiration, Ariz.
George H. Gilman, 125 Prescott St., East Boston, Mass.
Charles Lees, Superintendent, Iron Cap Copper Co., Copper Hill, Ariz.
Charles A. Smith, Mine Superintendent, Ray Cons. Copper Co., Ray, Ariz.
Roy Marks, Stope Engineer, Box 1676, United Verde Exten. Mining Co., Jerome, Ariz.
Earl Hastings, 816 North Sixth Avenue, Phoenix, Ariz.
Frank Aver, Mine Superintendent, Moctezuma Copper Co., Pilares De Nacozari, Sonora, Mex.
W. G. Scott, Superintendent, Coronado Mines, Arizona Copper Co., Ltd., Metcalf, Ariz.
Charles Officer, Sullivan Machinery Co., Chicago, Ill.
A. S. Uhler, Ingersoll-Rand Co., New York City
George A. Shaw, Efficiency Engineer, Denver Rock Drill Manufacturing Co., Denver, Colo.
H. T. Walsh, V. P., Sullivan Machinery Co., Chicago, Ill.
R. A. Scott, S. Mgr., Denver Rock Drill Mfg. Co., Denver, Colo.
Bruce Yates, Homestake Mining Co., Lead, S. D.

Inner Committee
Drilling Machines and Drill Steel

Frank Ayer, Superintendent, Moctezuma Copper Co., Nacozari, Sonora, Mexico.
H. Seamon, Drill Efficiency Engineer, United Verde Copper Co., Jerome, Ariz.
Charles A. Smith, Superintendent, Ray Cons. Copper Co., Ray, Ariz.
Arthur Notman, Superintendent, Copper Queen Br., Phelps-Dodge Corp., Bisbee, Ariz.
George Gilman, 125 Prescott St., E. Boston, Mass.
H. T. Walsh, Vice-President, Sullivan Machinery Co., Chicago, Ill.
George A. Shaw, Efficiency Engineer, Denver Rock Drill Manufacturing Co., Denver, Colo.
L. C. Bayles, Chief Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.

Underground Transportation

William B. Daly, *Chairman*

George H. Booth, Mechanical Engineer, Inspiration Cons. Copper Co., Inspiration, Ariz.
Andover Syverson, Chief Engineer, United Verde Exten. Mining Co., Jerome, Ariz.
E. M. Morris, Asst. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
R. R. Boyd, Asst. Superintendent, Mine Dept., Copper Mining Branch, Phelps-Dodge Corp., Bisbee, Ariz.
T. K. Scott, Chief Engineer, Box 100, Miami Copper Co., Miami, Ariz.
H. T. Hamilton, Manager, Moctezuma Copper Co., Nacozari, Sonora, Mexico.
R. E. Howe, Asst. General Manager, Cananea Cons. Copper Co., Cananea, Sonora, Mexico.
D. S. Calland, Managing Director, Compania de Real del Monte de Pachuca, Pachuca, Hidalgo, Mexico.
Robt. H. Dickson, Chief Engineer, Calumet & Arizona Mining Co., Warren, Arizona
Stanly A. Easton, Kellogg, Idaho
John Kiddie, Arizona Copper Co., Morenci, Ariz.
Ole Hallingby, Lascelle Mine, Calumet & Hecla Mining Co., Calumet, Mich.
C. A. Lantz, Gen'l Mgr., Cia de Santa Gertrudis, Pachuca, Mexico

Fire Fighting Equipment

William Conibear, *Chairman*

J. T. Young, Safety Inspector, Arizona Copper Company, Morenci, Ariz.
Orr Woodburn, Safety First Director, Globe-Miami District, Globe, Ariz.
A. A. Krogdahl, Safety Engineer, Oliver Iron Mining Co., Virginia, Minn.
Guy J. Johnson, Safety Engineer, Homestake Mining Company, Lead, S. Dak.
H. J. Rahilly, Superintendent, Mine Fire & Hydraulic Filling Dept., Anaconda Copper Mining Company, Butte, Mont.
Byron O. Pickard, District Mining Engineer, Bureau of Mines, Berkeley, Calif.
C. W. Moon, Safety Inspector, Phelps-Dodge Corporation, Bisbee, Ariz.

Steam Shovel Equipment

H. C. Goodrich, *Chairman*

Robert E. Tally, General Superintendent, United Verde Copper Company, Clarkdale, Ariz.
G. W. Barnhart, Manager, San Francisco Branch, Marion Steam Shovel Co., San Francisco, Calif.
C. B. Lakenan, General Manager, Nevada Cons. Copper Co., McGill, Nev.
H. G. S. Anderson, Mining & Metallurgical Engineer, Hurley, N. Mex.
T. A. Snyder, Bucyrus Co., Milwaukee, Wis.
George Mieyr, Phelps-Dodge Corp., Bisbee, Ariz.
M. Curley, Gen'l Supt., New Cornelia Copper Co., Ajo, Arizona.

Mine Ventilation

Charles A. Mitke, *Chairman* (Temporary)

A. C. Stoddard, Chief Engineer, Inspiration Cons. Copper Co., Box 15, Inspiration, Ariz.
D. Harrington, care Bureau of Mines, Denver, Colo.
Norman G. Hardy, Chief Mechanical Engineer, Smelter Dept., Arizona Copper Co., Clifton, Ariz.
W. A. Rowe, Chief Engineer, American Blower Co., Detroit, Mich.
E. B. Williams, Manager, Mine Fan Dept., B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Robert N. Bell, State Mine Inspector, Boise, Idaho
F. L. Stone, care General Electric Co., Schenectady, N. Y.
C. E. Legrand, Consulting Engineer, Phelps-Dodge Corp., Douglas, Ariz.
O. K. Dyer, Buffalo Forge Company, Buffalo, N. Y.
Don M. Rait, Asst. Superintendent of Mines, Calumet and Arizona Mining Co., Warren, Ariz.
A. S. Richardson, Chief of Ventilating Department Anaconda Copper Mining Co., Drawer 1375, Butte, Mont.
Walter C. Browning, Magna Copper Company, Superior, Ariz.

Mechanical Loading Underground

Lucien Eaton, *Chairman*

H. E. Billington, Manager of Sales, The Thew Shovel Co., Lorain, Ohio
J. H. Hensley, Mine Superintendent, Miami Copper Company, Miami, Ariz.
H. DeWitt Smith, Superintendent of Mines, United Verde Copper Co., Jerome, Ariz.
William Whaley, General Manager, Myers-Whaley Co., Knoxville, Tenn.
E. E. Whitely, Calumet & Arizona Mining Co., Warren, Ariz.
Karl Baumgarten, U. S. Bureau of Mines, St. Louis, Mo.

Mine Timbers

Gerald Sherman, *Chairman*

W. G. McBride, General Manager, Old Dominion Co., Globe, Ariz.
Ira B. Joralemon, Asst. General Manager, Calumet & Arizona Mining Co., Warren, Ariz.
Felix McDonald, Mines Superintendent, Inspiration Cons. Copper Co., Inspiration, Ariz.
John Kiddie, Division Superintendent, Arizona Copper Company, Morenci, Ariz.
W. S. Boyd, Manager, Ray Cons. Copper Co., Ray, Ariz.
T. Evans, General Supt., Cananea Cons. Copper Co., Cananea, Sonora, Mexico
C. L. Berrien, Anaconda Copper Co., Butte, Mont.
George M. Hunt, Forest Products Laboratory, Madison, Wis.
G. R. Jackson, Supt., Negaunee Mine, Cleveland Cliffs Iron Co., Negaunee, Mich.

Mine Accounting

T. O. McGrath, *Chairman*

L. S. Cates, General Mgr., Utah Copper Co., Salt Lake City, Utah
J. C. Dick, Dooly Block, Salt Lake City, Utah.
H. H. Miller, General Auditor, Hercules Mining Co., Wallace, Idaho
H. L. Norton, Phelps-Dodge Corporation, Douglas, Ariz.
Harry Vivian, Chief Engineer, Calumet and Hecla Mining Co., Calumet, Mich.
L. K. Diffenderfer, Treasurer, Vanadium Corp., 120 Broadway, New York City.
George Young, Cananea, Sonora, Mexico
H. B. Fernald, 54 Wall St., New York City

Milling and Smelting Practices and Equipment

Forest Rutherford, *Chairman*

J. O. Ambler, Phelps Dodge Corpn., Clifton, Ariz.
Herman C. Bellinger, Vice-Pres., Chile Exploration Co., 120 Broadway, New York City.
P. P. Butler, Smelter Supt., Phelps Dodge Corpn., Douglas, Arizona.
Allan J. Clark, Supt. of Mills, Homestake Mining Co., Lead, S. D.
Harry A. Clark, Smelter Supt., Calumet & Arizona Mining Co., Douglas, Ariz.

The GLENS RUN COAL COMPANY

Steam and Domestic Coals

648 KIRBY BUILDING, CLEVELAND, OHIO

The Morris Coal Co.

Miners and Shippers Of

GENUINE CAMBRIDGE COAL

515 BULKLEY BUILDING
CLEVELAND, OHIO

J. A. Paisley, President — Jas. Playfair, Vice Pres.
H. E. Kinloch, Gen'l Supt. — F. W. Eriser, Treas.
John McCartney Kennedy, Sec'y

The Valley Camp Coal Company

B. R. T. Bldg., West 9th and Superior Avenue
CLEVELAND, OHIO

RAIL, LAKE AND TIDEWATER SHIPMENTS
Annual Production—5,000,000 Tons

Upper Lake Docks
Great Lakes Coal & Dock Co.,
Superior, Wisconsin
Wisconsin Great Lakes Coal & Dock Co.,
Milwaukee, Wisconsin
Fort William Coal Dock Co., Ltd.,
Fort William, Ontario

Fuel Docks
The Valley Camp Coal Co.,
Detour, Michigan
The Valley Camp Coal Co. of Canada, Ltd.,
Port Colborne, Ontario

Boat Companies
The Valley Camp Steamship Co.
The Morrow Steamship Co.
The Paisley Steamship Co.
Great Lakes Transportation Co., Ltd.

Affiliated Companies
Elm Grove Mining Co.
Glendale Gas Coal Co.
The Elm Grove Mining Co. of Ohio
Connellsville By-Product Coal Co.

Branch Offices

608 Park Bldg., Pittsburgh, Pa.
Bank of Morgantown Bldg., Morgantown, West Va.
508 Kanawha B. & T. Bldg., Charleston, West Va.
Elm Grove Mining Co., Elm Grove, West Va.
902 First Nat'l Bank Bldg., Milwaukee, Wis.
900 Security Bldg., Minneapolis, Minn.
4182 St. Catherine St., Montreal, Quebec
Fort William Coal Dock Co., Ltd., Fort William, Ont.
Great Lakes Transportation Co., Ltd., Midland, Ont.

Cable Address: "Paisley New York"—"Valcamp Cleveland"—Bentley's Code Used

George A. Enos Coal Company

CLEVELAND, OHIO

Ohio Mines

SALINEVILLE, OHIO.....Penna. Ry.
NEW PHILADELPHIA, OHIO..Penna. Ry.
BERGHOLZ, OHIO.....N. Y. C. Ry.
SANDYVILLE, OHIO.....B. & O. Ry.
TEEGARDEN, OHIO.....Erie Ry.

Indiana Mines

ENOS, PIKE COUNTY.....Southern Ry.

Shaker Screens, Picking Tables and Boom Loaders

Standard Sizes

Output.....4,000 tons daily

Arthur Crowfoot, Mill Supt., Phelps Dodge Corpn., Morenci, Ariz.
F. L. Flynn, Toltec Club, El Paso, Texas.
G. W. Prince, Smelter Supt., United Verde Extension Mining Co., Clemenceau, Ariz.
Guy R. Ruggles, Supt. of Mills, Inspiration Cons. Copper Co., Inspiration, Ariz.
Henry A. Tobelman, 138 Halsey St., Brooklyn, N. Y.

Methods of Mine Sampling

Philip Wilson, *Chairman*

Guy Bjorge, 788 Mills Bldg., San Francisco, Calif.
E. L. Derby, Geologist, Cleveland Cliffs Iron Co., Ishpeming, Mich.
L. C. Graton, Professor of Geology, Harvard University, Cambridge, Mass.
MacHenry Mosier, Geologist, Clifton-Morenci Br., Phelps Dodge Corpn., Morenci, Ariz.
F. A. Linforth, Geological Dept., Anaconda Copper Mining Co., Butte, Montana.
Louis Reber, Chief Geologist, United Verde Copper Co., Jerome, Arizona.
J. B. Tenney, Geologist, Copper Queen Branch, Phelps Dodge Corpn., Bisbee, Arizona.
Morton Webber, 165 Broadway, New York City.
T. Skewes Saunders, Consulting Engr., University Club, Bucareli 35, Mexico City, Mexico.

Joint Publicity Committee

Representing Coal Mining Branch:

Ralph Becker, Evanston, Ill.
C. H. Trik, Jeffrey Mfg. Co., Columbus, Ohio

Representing Metal Mining Branch:

Chas. F. Willis, Phoenix, Ariz.
T. O. McGrath, Bisbee, Ariz.

NEW YORK
No. 1870 Hudson Terminal Building
Courtland 3354

CLEVELAND
E. 38th Street and Lakeside Ave.
Prospect 1776

DETROIT
3-140 General Motors Building
Market 5627

WHOLESALE COAL COMPANY

General Offices:

Chamber of Commerce Building, Pittsburgh

Bell Phones: Grant 6920-2-3-4

P. & A. Phone: Main 1390

CORRY, PA.
145 N. Center St.
Phone 262-M

COVINGTON, KY.
Lawyers Building
South 6692

SMITH FALLS, ONTARIO
No. 44 Main Street
Phone 107

Caldwell Smokeless Coal Company

Miners of

SMOKELESS BITUMINOUS COAL

Sales Agents
CAMPBELL, PEACOCK & KINZER, Inc.
PHILADELPHIA NEW YORK

GENERAL OFFICES
1410 Widener Building, Philadelphia, Pa.

Mines located on P. R. R. and B. R. & P. Railroad in Pennsylvania

Schrolucke Coal Company

1506 Fletcher Trust Building
INDIANAPOLIS, INDIANA

Producers of
Indiana Steam and Domestic Coal

Operating
Panhandle Coal Co.
Bicknell, Knox County, Indiana
Linton No. 4 Coal Co.
Linton, Indiana

Primrose Coal Producing Co.
Jasonville, Indiana

Carlisle Coal Co.
Carlisle, Ind.

WE-FU-GO AND SCAIFE
WATER
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES
WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

Westmoreland Coal Company

Capital $10,000,000

Colliery Owners, Miners and Shippers

5,000,000 Tons Annually

Highest Grade Gas Coal

This Coal is unexcelled for use in the manufacture of Illuminating or Producer Gas. For Iron, Steel, Metal and Glass Manufacture; for Brick, Terra Cotta, and Lime Burning; for Locomotive and Steam Thresher Use; for High Pressure Steaming; for All Uses where a strong and pure fuel is required it has no equal.

ADDRESS—	LOADING PORTS—
224 South Third St.,	Philadelphia, Pa.
Philadelphia, Pa., U. S. A.	Baltimore, Md.

Cable Address—WESTMOLAND

Weston Dodson & Co., Inc.

ANTHRACITE AND BITUMINOUS COALS

General Offices:
BETHLEHEM

BRANCH OFFICES:

NEW YORK
PHILADELPHIA
NEW HAVEN
BUFFALO
SCRANTON
BALTIMORE

CAMBRIDGE MINES
Little Kate No. 1
Little Kate No. 2
Harryette
Minnehaha
MacFarlin

PENNA. CO. and B. & O. R. R'ds

PITTSBURG —8— MINES

LOOMIS

The National Coal Company

Miners and Shippers

CAPACITY—2,500,000 TONS ANNUALLY

Steam and Gas Producer Coal

GENERAL OFFICES:
Rockefeller Building, CLEVELAND, OHIO

Clarkson Coal Mining Co.

General Offices
603 Kirby Building
CLEVELAND, OHIO

Miners *and* Shippers

OF

Pittsburgh No. 8 Coal

Mines at:
CLARKSON, OHIO
FAIRPOINT, OHIO
DUN GLEN, OHIO

THE
IRONTON
STORAGE BATTERY LOCOMOTIVE

A New Low Type—
Only 31 Inches High

Single motor, gear driven to both axles. Large battery capacity.

Exhibited in Spaces
158-159
National Exposition of Mines and Mining Equipment

The Ironton Engine Company
Main Office and Factory, IRONTON, OHIO
PITTSBURGH, PHILADELPHIA, ST. LOUIS, DENVER, SEATTLE
HUNTINGTON, W.VA., BIRMINGHAM, ALA.
FORT SMITH, ARK.
Canadian Representatives, Powley & Moody, Ltd.
105 Bond Street, Toronto

JOHN BOYLE, JR.
Attorney-at-Law
Patents
B. S. in Mining Engineering and Metallurgy
16 years in the examining corps of the U. S. Patent Office
OURAY BLDG., WASHINGTON, D. C.

Orvis C. Hoffman Leon H. Hoffman
DIAMOND CORE DRILLING
—CONTRACTORS—
HOFFMAN BROS.
PUNXSUTAWNEY, PA.
(Our Specialty—Testing Bituminous Coal Lands)
Up-To-Date Equipments. Expert Drill Runners. Inquiries Solicited

THE
WEST VIRGINIA
RAIL CO.
Manufacturers
Light Steel Rails
and Accessories
8, 12, 16, 20, 25, 30, 35, 40, 45 lbs. per yd.
Mills and General Offices
HUNTINGTON
W. Virginia

SAFETY FIRST
Stonehouse SIGNS, INC.
STONEHOUSE BLDG. 842 LARIMER ST. DENVER COLO. U.S.A.
Stock and Special Signs, Codes, etc., for Mines

WILDBERG BROS.
Smelters, Refiners and Buyers of
Gold, Silver and Platinum Ores and Concentrates, Gold Dust, Bullion and Native Platinum
Producers of Assayer's **Proof Gold** and **Silver**
Offices; 742 Market St., San Francisco
Smelter: South San Francisco, Cal.

THE BOGUE SUPPLY CO.
DEALERS IN
NEW AND USED MACHINERY AND SUPPLIES
M. J. McGILL, MGR. SALT LAKE CITY, UTAH

Crushers	Bearings	Pumps
Rolls	Pulleys	Motors
Shafting	Boilers	Wilfley Tables
	Engines	

2—Simplex Dorr Classifiers
1—Duplex Dorr Classifier
1—18-H. P. Western Distillate Hoist
1—5-H. P. Fairbanks Morse Hoist
1—Dings Separator
3—Troy Trailers
2—Complete Concentrating Mills
2—Flotation Mills Complete

CARNEGIE COAL COMPANY

Producers and Shippers of

PITTSBURGH-YOUGHIOGHENY

"SPECIALLY PREPARED"

STEAM AND DOMESTIC

COAL

GENERAL OFFICES

7th Floor, Oliver Building, Pittsburgh, Pa.

UPPER LAKE DOCKS

Duluth, Minn. Superior, Wis.

LINCOLN GAS COAL CO.

Miners and Operators

PITTSBURGH GAS SEAM

Box 53

1920 Farmers Bank Building

PITTSBURGH, PA.

Pittsburgh & Bessemer Coal Company

—

MINERS

Westmoreland and Pittsburgh Youghiogheny, Fairmont Pittsburgh No. 8 and Hocking

Mines

Located on Pennsylvania System, Baltimore & Ohio, Wheeling & Lake Erie, Hocking Valley and New York Central Railways

—

First National Bank Building

PITTSBURGH, PA., U. S. A.

BRANCHES

Columbus, O., Rowlands Building.
Cleveland, Ohio, Hanna Building

OGLE COAL COMPANY

OFFICERS

A. M. OGLE, President

W. R. BATTY, Vice-President

H. W. REDMAN, Chicago Sales Manager

OFFICES

INDIANAPOLIS, INDIANA

CINCINNATI **CHICAGO** **MASON CITY, IOWA**

INDEX TO ADVERTISERS

A

Alaska Steamship Co. 18
Aldrich Pump Company 48
Allis Chalmers Mfg. Co. 30
Ameling Prospecting Co., H. R. 97
American Cyanamid Co. 4
American Manganese Manufacturing Co. 99
American Metal Company, Ltd. 71
American Mine Door Co. 100
American Steel & Wire Co. 62
American Trona Corporation 17
American Zinc, Lead & Smelting Co. 70
Anaconda Copper Mining Co. 70

B

Barrett, Haentjens & Company 86
Big Creek Coals, Inc. 101
Bogle & Co., W. S. 129
Bogue Supply Co. 134
Boyle, John 134
Buckeye Blower Company 57
Burton Coal Company, The J. P. 119
Byers Company, A. M. 7
Byron Jackson Iron Works 26

C

Caldwell Smokeless Coal Co. 132
California Cap Co. Cover 3
Calumet & Arizona Mining Co. 20
Calumet & Hecla Mining Co. 23
Cambridge Collieries Co., The 122
Carnegie Coal Company 135
Carson Hill Gold Mining Company 77
Central Frog & Switch Co. 97
Chaparral Hill Gold Mining Company 75
Chicago Perforating Co. 134
Clarkson Coal Mining Co. 133
Cleveland Cliffs Iron Company 83
Cleveland Rock Drill Company 60
Cleveland Wire Cloth & Manufacturing Co. 93
Clinchfield Fuel Co. 113
Clinton Refrigerating Company 50
Coal Bluff Mining Co. 125
Coates & Tweed 99
Colonial Supply Co. 74
Colorado Fuel & Iron Company 116
Connellsville Mfg. & Mine Supply Company 97
Consolidated Coal Co. 125
Copper & Brass Research Association 14
Copper Range Co. 24
Crozer-Pocahontas Coal Company 123

D

Delaware, Lackawanna & Western Coal Co. 138
Denver Rock Drill Mfg. Co. 3
Dering Coal Co., J. K. 116
Dickson & Eddy 129
Dravo Contracting Co. 64
du Pont de Nemours & Company, E. I. 40-41, 87

E

Edison Storage Battery Co. 34
Electric Railway Improvement Company 50
Enos Coal Mining Company 131

F

Federal Electric Company 49
Fleming & Son, J. R. 51
Flexible Steel Lacing Company 65
Ford Collieries Company 126

G

Gilman Printing Company, A. S. 129
Glens Run Coal Company 131
Golden-Anderson Valve Specialty Co. 8–9
Goodman Mfg. Co. 56
Goodrich Company, B. F. 59
Graphite Corporation 99
Grasselli Chemical Company 72
Greene-Cananea Copper Co. 22

H

Hanna & Co., M. A. 79
Hazard Manufacturing Co. 46
Hercules Powder Company 32–33
Heyl & Patterson, Inc. 89
Hoar Shovel Co., Inc. 67
Hockensmith Wheel & Mine Car Company 61
Hoffman Brothers 134
Holmes & Bros., Robert 62
Hudson Coal Company 52–53
Hunt & Company, Robert W. 100

I

Ingersoll-Rand Company 15
Inspiration Consolidated Copper Company 22
Ironton Engine Co. 134
Irvington Smelting & Refining Works 97
Jackson Compressor Company 72
Jacobsen & Schraeder, Inc. Cover 2
Jeffrey Manufacturing Company Cover 4

L

Lehigh Coal & Navigation Co. 112, 127
Lehigh Valley Coal Company 115
Lehigh & Wilkes Barre Coal Company 114
Leschen & Sons Rope Co., A. 44
Lidgerwood Mfg. Company 80
Lincoln Gas Coal Co. 135
Little Hatchet Mining Company 100
Logan Coal Co. 124
Ludlow Saylor Wire Company 47
Lunkenheimer Company 97

M

Madeira, Hill & Company 123
Magma Copper Company 24
Maher Collieries Company 119
Mancha Storage Battery Locomotive Co. 35
Merrick Scale Mfg. Co. 46
Mexican Petroleum Co., Ltd. 13
Miami Coal Company 118
Miami Copper Company 68
Mine Safety Appliances Co. 64
Morris Coal Company 131
Morse Brothers Machinery & Supply Co. 95
Morse Chain Company 54–55
Mt. Olive & Staunton Coal Company 104

N

Nason Coal Company 105
National Coal Company 133
National Fuse & Powder Co. 95
New Cornelia Copper Co. 20
New Jersey Zinc Company 68
New York Engineering Company 74

O

O'Gara Coal Company 120
Ogle Coal Co. 136
Oglebay Norton & Company 81
Ohio Brass Company 38
Old Ben Coal Corporation 103

P

Pacific Tank & Pipe Co. 93
Peabody Coal Company 102
Peabody Fuel Company 108
Peerless Coal Company 126
Pennsylvania Smelting Co. 100
Petroleum Iron Works Company 95
Phelps Dodge Corporation 21, 100
Philadelphia and Reading Coal & Iron Co. 107
Pickands, Mather & Co. 82
Pittsburgh & Bessemer Coal Co. 135
Pittsburgh & Ohio Mining Company 120
Plymouth Consolidated Gold Mining Company 73
Prest-O-Lite Co. 91

Q

Quinn & Company, Clement K. 78

R

Rail & River Coal Company 121
Redwood Manufacturing Co. 86
Roberts & Schaefer Company 50
Roebling's Sons Company, John A. 43, 97
Roessler & Hasslacher Chemical Company 6
Rutledge and Taylor Coal Co. 110

S

Scaife & Sons Co., Wm. B. 132
Schrolucke Coal Co. 132
Shenango Furnace Company 80
Shirkie Coal Co. 117
Shoal Creek Coal Company 118
S. K. F. Industries 66
Standard Oil Company 93
St. Louis & O'Fallon Coal Company 126
Southern Wheel Company 31
Stewart Furnace Company 99
Stonega Coke & Coal Company 111
Stonehouse Steel Sign Company 66a, 134
Streeter-Amet Weighing & Recording Co. 39

T

Taylor Instrument Companies 95
Taylor, S. A. 126
Texas Gulf Sulphur Company 85
Thompson Manufacturing Company 76
Thorne, Neale & Co. 127
Timken Roller Bearing Co. 37
Tod-Stambaugh Company 78
Traylor Engineering & Mfg. Co. 11
Tyler Company, W. S. 36

U

Union Sulphur Company, The 84
United Filters Corporation 45
United Metals Selling Co. 69
United States Coal Co. 109
United Verde Extension Mining Company 25
Utah Copper Company 19

V

Valley Camp Coal Co. 131
Vanadium Corporation of America 16

W

Warner & Company, W. H. 121
Wellman Seaver Morgan Co. 60
Western Belting and Packing Company 76
Westinghouse Electric & Mfg. Co. 42
Westmoreland Coal Co. 133
Weston, Dodson & Co. 133
West Virginia Rail Company 134
Whitcomb Company, Geo. D. 63
Whitney & Kemmerer 124
Wholesale Coal Company 132
Wildberg Bros 134
Williams & Peters 106
Williamsport Wire Rope Co. 58
Wilmot Engineering Co. 100
Wood Shovel and Tool Co. 90

Y

Youghiogheny & Ohio Coal Company 122

THE DELAWARE LACKAWANNA AND WESTERN COAL CO.

Sole Vendors of

THE STANDARD SCRANTON ANTHRACITE

J. F. BERMINGHAM . . . . . President
H. A. SMITH . . . . . Vice-President

120 BROADWAY, NEW YORK

J. H. ABBOTT, Tidewater Sales Agent,
120 Broadway, New York

S. G. MEMORY, Sales Agent,
Broad and Market, Newark, N. J.

A. W. DECKER, Sales Agent,
Scranton Life Building, Scranton, Pa.

JOHN J. TOWN, Sales Agent,
64 Martin Building, Utica, N. Y.

H. W. MARSHALL, Salesman,
1620 W. Fayette St., Syracuse, N. Y.

Ogdensburg Coal & Towing Co., Sales Agts.,
134 McCord Street, Montreal, Que.

NORTHWESTERN FUEL CO.
Sales Agents
Merchants' Nat'l Bank Bldg., St. Paul
Duluth, Minn. Superior, Wis.

E. H. READ, Sales Agent,
924 Prudential Bldg., Buffalo, N. Y.

W. B. PALMER, Sales Agent,
Penobscot Building, Detroit, Mich.

L. R. SCHENCK, Sales Agent,
1112 Nicholas Building, Toledo, O.

Hedstrom-Schenck Coal Co., Sales Agents,
Old Colony Building, Chicago, Ill.

Milwaukee-Western Fuel Co., Sales Agents,
14th Floor, Wells Bldg., Milwaukee, Wis.

It takes a perfect detonator to produce a perfect blast. California Blasting Caps give you both - - - -

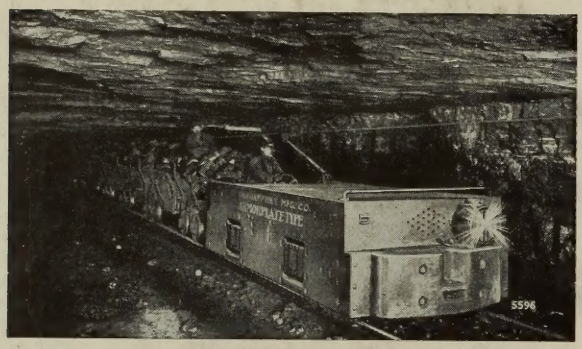
CALIFORNIA CAP COMPANY
OAKLAND = CALIFORNIA

Manufacturers of Blasting Caps, Instantaneous and Delay Electric Detonators, Blasting Machines and Accessories. Obtainable through Powder Companies and Dealers in Explosives.

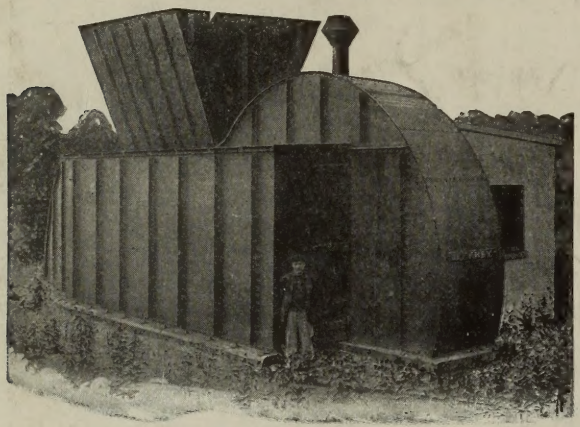
THE
DETONATOR

A monthly periodical devoted to the interest of the mining industry and featuring concise Talks on the latest and most approved blasting methods. Mailed regularly upon request, without charge.

35-B SHORTWALL Coal Cutter. A simple, rugged machine, easily operated and controlled under all mine conditions



ARMORPLATE Type Main Haulage Locomotive. The standard main haulage equipment of most mines



Stepped Multi-Bladed Mine Fan. Saves 10 to 30 Percent in power costs

For Over Forty Years

Jeffrey Engineers have co-operated with the men responsible for results in the mining field.

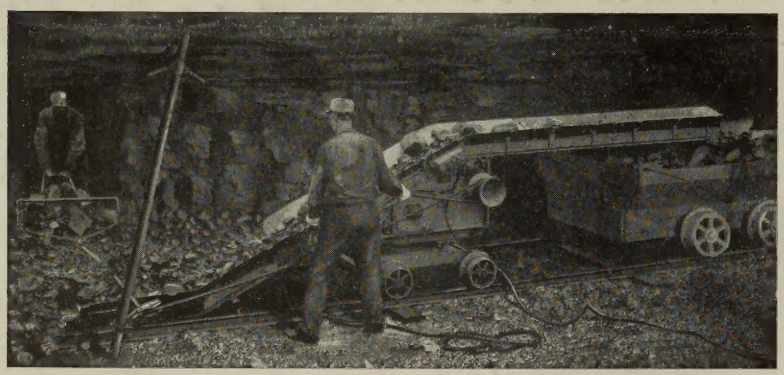
This has been productive of successful equipment which has been a deciding factor in obtaining greatest production at lowest cost per ton in the leading operations of the country.

To meet the imperative demands of industry TODAY will mean in many mines new methods, faster and more dependable equipment, higher efficiency from working face to railroad car—and Jeffrey Experts are ready to help you select the right equipment to meet the emergency.

For every phase of activity in the mining of coal there is obtainable a Jeffrey Equipment of proved ability—Drills; Coal Cutters; Pit Car Loaders; Haulage and Gathering Locomotives; Ventilation Fans; Tipple Equipment, including Elevators, Conveyors, Picking Tables and Adjustable Loading Booms, Shaking Screens, Car Hauls, Crushers, Pulverizers, Etc.

The Jeffrey Manufacturing Co.

958-99 North Fourth St., Columbus, Ohio



38-A Pit Car Loader. Light, portable and easily handled

Jeffrey Combination Picking Tables and Loading Booms insure the delivery of clean, unbroken coal to railroad car

JEFFREY

RANSDELL INCORPORATED, *Printers*, WASHINGTON, D. C.